MEASURING HAND HYGIENE ADHERENCE: OVERCOMING THE CHALLENGES

This monograph was authored by The Joint Commission in collaboration with the following organizations:

- The Association for Professionals in Infection Control and Epidemiology, Inc.
- The Centers for Disease Control and Prevention
- The Institute for Healthcare Improvement
- The National Foundation for Infectious Diseases
- The Society for Healthcare Epidemiology of America
- The World Health Organization World Alliance for Patient Safety

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The Joint Commission Mission

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Many of the examples included in this monograph come from self-reported methods, tools, and data submitted by health care organizations to the CMHH project, as well as published literature. Examples included in this monograph are intended to aid health care organizations in their own hand hygiene efforts and should not necessarily be considered evidence based. Inclusion of any reference or example should not be construed as an endorsement of any measurement method, product, treatment, or program discussed therein. The inclusion of a vendor, product name, or service should not be construed as an endorsement of such vendor, product, or service, nor is failure to include the name of a vendor, product, or service to be construed as disapproval.

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Foreword

Why would anyone write such a lengthy monograph about measuring adherence to hand hygiene guidelines? More importantly, why should anyone read it? The practice of hand hygiene has long been recognized as the most important way to reduce the transmission of pathogens in health care settings. Measuring adherence to hand hygiene practice is fundamental to demonstrating improvements both at an organization and a national level.

However, measuring health care worker adherence to hand hygiene guidelines is not a simple matter. Differing opinions and misinformation abound. We invite you to consider whether the following statements are true or false.

1. Everybody knows when to clean their hands.

False. While most of us know when to perform hand hygiene in our personal lives, health care workers who come in contact with patients or the patients' environment are expected to perform hand hygiene many more times throughout the encounter. These indications for hand hygiene are described in professional guidelines and policies. Within a single encounter with a patient, there can be several times when hand hygiene should be performed. Studies show that continuing education is needed to inform and remind health care workers of the indications for hand hygiene.

2. It is easy to determine whether a person has cleaned his or her hands.

False. It may be obvious if someone is performing hand hygiene, but it is also important to consider how well the person performs hand hygiene and whether the person used the appropriate product. A quick rinse under the sink or brief rub between palms with alcohol-based hand rub may not be thorough enough to eliminate potential pathogens. Professional guidelines describe the proper techniques that should be used as well as when to use soap and water instead of hand rub.

It is also important to link the action of hand hygiene with the indications for hand hygiene described in the professional guidelines. It is possible that a person performed hand hygiene when he or she didn't need to or that the person did not perform it when needed. Finally, even if you don't see a health care worker performing hand hygiene, consider the fact that it may have been done prior to coming into the room or outside of your field of vision. You may want to consider asking a health care worker about it if you are unsure.

3. People who don't perform hand hygiene when they should are careless or lazy or both.

Usually false. The vast majority of health care workers continually strive to do the right thing and try very hard to avoid harming patients. As described by Voss and Widmer, expecting perfection and 100% adherence is unrealistic, and we must "put an end to the reflex response that health care workers are neglectful of hand hygiene, which, far from helping, only demoralizes them further."[1(p. 208)] Studies have shown that organizational characteristics such as leadership involvement, reminders, convenient availability of products, and staff workload have a big influence on hand

hygiene performance. Health care organizations need to integrate hand hygiene into routine procedures and have in place strong systems to support, monitor, and promote the correct behavior.

4. A hospital that reports a 95% rate of compliance with hand hygiene guidelines is better than a hospital that reports 75% compliance.

Unknown (could be true or false). Don't be misled by statistics. Unfortunately, there is no standardized method for collecting and reporting rates of hand hygiene compliance. Organizations measure compliance in many different ways and in many different areas of an organization. Some organizations consider each indication for hand hygiene and sample groups of health care workers throughout the organization. Others measure more narrowly—for example, measuring whether hand hygiene was performed before and after care in the intensive care unit. The compliance rate is greatly influenced by what indications are chosen for measurement as well as where and how compliance is measured. As with any other performance measure rate, one should only compare rates to others that have defined, collected, and reported the same data in exactly the same way.

5. Observing care is the only way to get a valid assessment of hand hygiene guideline adherence rates.

Not necessarily true. Observation of care has important advantages, such as allowing you to directly link the activity of hand hygiene to the indication for hand hygiene. However, the observation method also has inherent limitations and potential biases (such as the Hawthorne effect, in which people change behavior because they know they are being observed). Collecting reliable observation data requires a highly structured method of both observing care and documenting data.[2] Other methods, such as measuring product consumption, have different strengths and weaknesses. Using multiple measurement approaches helps to verify findings. Unfortunately, there is no perfect method for measuring hand hygiene adherence, and it is important to acknowledge the limitations of the measurement method used when rates are reported.

6. Excellent hand hygiene will reduce or eliminate health care–associated infections.

Partially true. In fact, the Centers for Disease Control and Prevention and the World Health Organization consider inadequate hand hygiene to be one of the most important contributors to infections.[3,4] There are, however, many factors that influence whether a patient becomes infected. Other factors include such things as patient severity of illness, equipment and environmental sanitation practices, and adherence to recommended practices (for example, using maximal barrier precautions during central line insertions).

We hope these answers have piqued your interest in the content of this monograph. This monograph is designed to address the saying "everything you ever wanted to know about hand hygiene measurement but were afraid to ask". Though easy answers are few, we hope this monograph will broaden your understanding of the issues and provide practical solutions for strengthening your measurement and improvement activities. We welcome your comments and suggestions for improvement.

Sincerely,
The Consensus Measurement
in Hand Hygiene Project Team

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Executive Summary

Hand Hygiene Measurement: Overcoming the Challenges

This monograph provides a framework to help health care workers make necessary decisions about what, when, why, and how they will measure hand hygiene performance. The monograph also includes resources to help organizations select the measurement approaches that will best fit their needs. There are two primary sources of content for this monograph. The first is examples of methods and tools submitted through the Consensus Measurement in Hand Hygiene project. The second is evidence-based guidelines and published literature.

Following effective hand hygiene practices has long been recognized as the most important way to reduce the transmission of pathogens in health care settings. Many studies, however, have shown that adherence to hand hygiene recommendations remains low and that improvement efforts frequently lack sustainability. The World Health Organization (WHO), the Centers for Disease Control and Prevention (CDC), and others have issued hand hygiene guidelines for health care workers. Hand hygiene guidelines specify a wide range of hand hygiene behaviors, including the following:

- When hand hygiene is indicated
- How to cleanse hands
- What agents to use and how to choose them
- How to dry hands, how long to dry them, and what instruments to use
- When and how to use disposable gloves
- The wearing of artificial nails and jewelry
- The infrastructure needed to support optimal hand hygiene

In 2004, The Joint Commission added a National Patient Safety Goal requiring that accredited health care organizations comply with hand hygiene guidelines. While most would agree that hand hygiene is of critical importance, many have found that measuring adherence to hand hygiene guidelines is not a simple task. The following are some of the specific challenges to measuring hand hygiene adherence:

- Contact with patients or their environment takes place in many locations within organizations.
- Opportunities for hand hygiene occur 24 hours a day, seven days a week, 365 days a year and involve both clinical and nonclinical staff.
- The frequency of hand hygiene opportunities varies by the type of care provided, the unit, and patient factors.
- Monitoring is often resource intensive; infection preventionists, quality improvement staff, and other health care workers (such as nursing, respiratory therapy, and so on) face numerous competing demands for their time and expertise.
- Observer bias (for example, the Hawthorne effect) is difficult to eliminate (as discussed in Chapter 3).

Hand Hygiene Measurement Methods

Before you select a measurement method, determine the answers to a few key questions:

- Why do you want to measure hand hygiene practices, and what are your organization's goals?
- What elements of hand hygiene do you want to measure?
- How do you want to measure hand hygiene?

There are three main methods for measuring hand hygiene performance, each of which has advantages and disadvantages:

- Directly observing
- Measuring product use
- Conducting surveys

Observation involves directly watching and recording the hand hygiene behavior of health care workers and the physical environment. Product measurement indirectly assesses hand hygiene guideline adherence by allowing health care workers to calculate the amount of liquid soap, alcohol-based hand rub, and paper towels used in a given area of the organization. Surveys gather information on health care worker perceptions, attitudes, and practices related to hand hygiene, as well as patients' and families' attitudes and perceptions of the hand hygiene practices of health care workers. Using more than one method to measure hand hygiene performance is likely to yield more reliable results than using a single method.

Direct Observation

Direct observation of the hand hygiene behavior of health care workers is considered the "gold standard" of measurement methods. Observation allows you to see which hand hygiene products are used, the thoroughness of cleansing, the tools and technique used for drying, the use of gloves, and whether the staff are performing hand hygiene whenever there is an opportunity to do so. This method allows observers to see who is (and who is not) adhering to guidelines and to give prompt feedback when improvement is needed. In addition, direct observation allows health care workers to evaluate facility-specific factors that may influence hand hygiene guideline adherence.

On the other hand, direct observation can be labor intensive and expensive, requiring the careful selection and training of those who will observe and record data. Perhaps the biggest disadvantage of this method is that it can influence the behavior of those who know they are being observed.

If you decide to measure adherence to hand hygiene guidelines using the direct observation method, you first need to decide who you want to observe; who will conduct the observations; and when, where, and how often to observe. The success of this method depends on the accurate calculation of adherence rates, the careful training of data collectors, and the data collectors' use of clear, easy-to-understand forms.

Measuring Product Use

Measuring the amount of liquid soap, alcohol-based hand rub, and paper towels that health care workers use—and measuring the frequency with which they use these products—is an indirect way of estimating staff adherence to hand hygiene guidelines. Measuring product use is less expensive than observing health care workers directly. It does not require as many staff members or as much training as the direct observation method. Measuring product use can be done at any time and in any place, and it allows you to track trends in your organization over time. And because measuring product use is unobtrusive, it is less likely than the direct observation method to influence health care workers to change their hand hygiene behavior.

On the other hand, measuring product use does not reveal whether health care workers are performing hand hygiene when it is indicated or whether they are performing it correctly. Measuring product use does not yield any contextual information about when or why hand hygiene guidelines are not adhered to, and it often does not tell you who is (or isn't) practicing hand hygiene. In addition, many factors contribute to making this measurement method prone to inaccuracy, including product waste or spillage, product use by patients and family members, and the borrowing of product between units. Because the number of opportunities for hand hygiene varies widely according to the setting and patient population, it is important to calculate the adherence rates using realistic numbers of expected opportunities.

One way to track the amount and frequency of product use is to manually weigh or measure the amount of liquid soap or alcohol-based hand rub on a given unit before and after a prescribed period of time. An alternative is use electronic counting devices and electronic monitoring systems to measure the frequency with which these products are used. In addition to expense, automated systems sometimes have other shortcomings that can compromise accuracy.

Conducting Surveys

Surveys of health care workers, patients, and family members—conducted in person, over the telephone, or in focus groups—can yield information about perceptions, attitudes, and behavior related to hand hygiene. Deciding how to administer a survey depends on the number of people you plan to reach, where they are located, and the complexity of the sample.

Through surveys, health care workers reveal what they know and think about hand hygiene as well as why they adhere (or do not adhere) to guidelines. Surveys can reveal whether health care workers' perceptions of their own hand hygiene behavior match the perceptions of patients and family members. Using surveys for self-reporting of hand hygiene behavior can be unreliable; health care workers tend to overestimate their adherence to guidelines when questioned and may inaccurately recall their past hand hygiene behavior.

Using a well-designed and carefully administered survey whose validity and reliability have been established can help you achieve the most accurate results possible. It is important to tailor your survey and the way you administer it to the population you want to survey and the information you need to know.

Assessing Thoroughness and Other Aspects of Hand Hygiene

It is as important to assess the technique with which health care workers perform hand hygiene as it is to measure when and how often they perform it. One way to assess and teach proper technique is to observe the staff periodically to answer the following questions:

- Are staff members using the proper volume of liquid soap or alcohol-based hand rub?
- Are they using these products for a sufficient amount of time?
- Are they avoiding recontamination after hand washing by using a paper towel to turn off the faucet?
- Are they donning and removing gloves correctly so as not to contaminate hands?

In addition to exploring answers to these questions, it can be useful to observe and record information on the length of health care workers' fingernails, their wearing of artificial nails, and their wearing of jewelry. Researchers have developed detailed data collection methodologies, audit tools, and scoring systems to help assess these issues as well as hand hygiene techniques.

International Hand Hygiene Measurement Tools and Improvement Efforts

There is great global interest in improving adherence to hand hygiene guidelines. In 2004, The WHO World Alliance for Patient Safety initiated a global response to the problem of health care–associated infection, with a major emphasis on the promotion of hand hygiene in health care. Many of the measurement and improvement tools developed for initiatives within and across countries are publicly available, widely field tested, and well worth considering for use in your organization.

The international campaigns and initiatives listed here include rigorously tested and validated tools and training programs to improve and measure hand hygiene performance:

- The WHO Global Patient Safety Challenge "Clean Care Is Safer Care" initiative is available at www.who.int/gpsc/country_work/application_form/en/index.html.
- The "cleanyourhands" campaign developed in England and Wales is available at www.npsa.nhs.uk/cleanyourhands/the-campaign/. The National Observational Study to Evaluate the

"cleanyourhands" Campaign (NOSEC) includes extensive training materials, including the "Hand Hygiene Observation Tool" (HHOT), available at www.idrn.org/nosec.php.

- Information on Ontario, Canada's "Just Clean Your Hands" program is available at www.justcleanyourhands.ca.
- New South Wales, Australia's "Clean Hands Saves Lives" campaign is available at: www.cec.health.nsw.gov.au/pdf/cleanhands/report/appendix14.pdf.
- Information on Health Protection Scotland's "Germs. Wash Your Hands of Them" is available at www.washyourhandsofthem.com/campaign/campaign_evaluation.html and www.scotland.gov.uk/Topics/Health/NHS-Scotland/19529/2005.

Displaying and Interpreting Hand Hygiene Data for Maximum Effectiveness

Simple charts and graphs can make data—such as data on when health care workers clean their hands and how they clean their hands—easy to interpret and use. A quality dashboard can provide an organization's leadership with a quick, at-a-glance summary of structure, process, and outcome. It is useful to stratify data by subgroups, such as specific hand hygiene opportunities or types of health care workers. Statistical process control charts are useful for revealing trends in data over time and can help you determine whether changes in rates are a result of specific interventions or due to normal variation.

Challenges to and Strategies for Improvement

It is important to investigate the reasons for non-adherence to hand hygiene guidelines before deciding on one or more improvement strategies. It is also useful to examine the organizational context of health care delivery, which may facilitate or inhibit adherence. Such organizational factors include the following:

- The facility's physical capacity for making products available
- The presence of written hand hygiene policies and procedures
- The active involvement of leadership "from the top down"
- The presence of role models
- The degree of accountability for non-adherent staff
- The presence of a culture of safety
- The active involvement of staff in improvement efforts
- The awareness and involvement of patients and families

Staff hand hygiene practices can be improved through efforts such as the following:

- Education
- Timely feedback
- Reminders
- Structured approaches to performance improvement

Hand Hygiene Measurement Improvement Resources

The following organizations, which collaborated with The Joint Commission on this monograph, are resources for information on improving the measurement of hand hygiene performance:

- The Association for Professionals in Infection Control and Epidemiology, Inc. (APIC) (www.apic.org)
- The Centers for Disease Control and Prevention (CDC) (www.cdc.gov)
- The Institute for Healthcare Improvement (IHI) (www.ihi.org)
- The National Foundation for Infectious Diseases (NFID) (www.nfid.org)
- The Society for Healthcare Epidemiology of America (SHEA) (www.shea-online.org)
- The World Health Organization (WHO) (www.who.int/gpsc/en/index.html)

Introduction

Purpose and Intended Audience

This monograph provides a framework to help health care workers make necessary decisions about what, when, why, and how they will measure hand hygiene performance. It is intended to meet a frequently expressed need among health care workers in hospitals, long term care, home care, and other settings by providing examples of promising practices for measuring adherence to hand hygiene guidelines. The monograph also includes helpful resources to assist readers in selecting the measurement approaches that will best fit their needs.

There are two primary sources of content for this monograph. The first is examples of methods and tools submitted through the Consensus Measurement in Hand Hygiene (CMHH) Project. The second is evidence-based guidelines and published literature. The examples of methods and tools included in this monograph are intended to aid health care organizations in their own hand hygiene efforts and should not necessarily be considered evidence based. Likewise, inclusion of specific examples, methods, and tools does not constitute endorsement by the monograph's collaborating organizations. Although most examples come from U.S. hospitals, the monograph is intended to be applicable across settings and countries. Readers wanting additional information on the examples should refer to Appendix I-1 for submitter contact information.

The measurement of hand hygiene performance is a dynamic field with rapidly changing evidence and techniques; therefore, the information presented in this document should be considered a snapshot as of mid-2008. This monograph should be regarded as a set of tools for working on a challenging problem rather than an absolute solution for success. It is not designed to serve as guidance for meeting accreditation or regulatory requirements. This monograph does not address surgical hand hygiene. Key terms used in the monograph are defined in the glossary (Appendix I-2).

The Consensus Measurement in Hand Hygiene (CMHH) Project

This project, started in the fall of 2006, is the result of a two-year collaboration involving The Joint Commission and the following six organizations:

- The World Health Organization (WHO) World Alliance for Patient Safety (WAPS)
- The Association for Professionals in Infection Control and Epidemiology (APIC)
- The Centers for Disease Control and Prevention (CDC)
- The Society for Healthcare Epidemiology of America (SHEA)
- The Institute for Healthcare Improvement (IHI)
- The National Foundation for Infectious Diseases (NFID)

The goal of the CMHH project is to identify promising, practical techniques for measuring adherence to hand hygiene guidelines. This project, conducted in the Joint

Commission's Division of Quality Measurement and Research, was funded by an unrestricted educational grant from GOJO Industries. The independent scientific advisor for the project was Elaine Larson, R.N., Ph.D., F.A.A.N., C.I.C., professor of Pharmaceutical and Therapeutic Research, Columbia University School of Nursing, and professor, Columbia University School of Public Health.

Why Measuring Adherence to Hand Hygiene Guidelines Is Important

Following effective hand hygiene practices has long been recognized as the most important way to reduce the transmission of pathogens in health care settings. Many studies, however, have shown that adherence to hand hygiene recommendations remains poor, and improvement efforts frequently lack sustainability.[2]

In 2002, the CDC released updated guidelines intended to stimulate improvement in hand hygiene practice throughout the nation.[3] In 2004, The Joint Commission added a National Patient Safety Goal requiring that health care organizations comply with the CDC guidelines.[4] In addition, the WHO-WAPS, as part of the "Clean Care is Safer Care" initiative, developed guidelines for hand hygiene in 2006.[5] Both the WHO guidelines and the CDC guidelines recommend that all health care organizations and settings monitor health care workers' adherence to hand hygiene recommendations.

Challenges to Measuring Hand Hygiene Adherence: Why It Is Not Easy

While most would agree that hand hygiene is of critical importance, many researchers have found that measuring adherence to hand hygiene guidelines is not a simple task. Haas and Larson recently concluded that there is no standard for measuring adherence to hand hygiene practices, and each method has advantages and disadvantages: "Without a standard definition of hand hygiene compliance, and/or lack

Text Box I-1.
CMHH Project Overview

The Joint Commission conducted a field survey in February 2007 to gather standardized information from organizations that considered their approaches to be potential examples of effective practice. An expert advisory panel, which included a representative from each of the collaborating organizations, identified criteria for evaluating the accuracy and usefulness of submitted measurement approaches and tools for possible inclusion in a monograph.[1]

The Joint Commission received a total of 242 responses, representing a variety of settings in 20 countries; 15 of the respondents voluntarily withdrew, 7 provided no identifiers, and 117 did not submit the required materials, such as a submitter's agreement, examples of tools, and data displays. Most submissions used observation to measure when hand hygiene was performed in relation to recommended practice; slightly less than half measured product consumption; and fewer (less than one-third) measured thoroughness, glove use, health care worker satisfaction, or other aspects of hand hygiene.

Most organizations collected data manually (74.1%), and some used technology (21.3%). Forty of 103 (38.8%) complete submissions met basic inclusion criteria (that is, the measurement method was clearly described, with detailed collection and reporting instructions and definitions, the method was used in practice and shown to be feasible, and accuracy and reliability of the method have been evaluated) and were reviewed by the expert panel. Most of the submitted methods had been actively used for a relatively short period of time; only about 20% reported having used their method for longer than three years. More than three-quarters of respondents reported they provided training for data collectors, but two-thirds of those conducting such training reported the time spent training was usually less than one hour. Forty-two percent of respondents reportedly assess the reliability or validity of the measurement methods they use, but they supplied little supporting documentation describing their processes. For additional information on project methods and findings, see Braun B.I. et al. 2009.

Appendix I-1, "Submissions Reviewed by the CMHH Panel" lists the sources of the measurement methods reviewed by the expert advisory panel in 2007.

of standardized methods of training observers, or defining who should be observers, it is easy to see why reported compliance rates vary considerably across studies."[6(p. 8)]

Few scientific studies have evaluated measurement techniques; a recent review of the reliability and validity of hand hygiene measures found that only 28% of research articles and guidelines related to hand hygiene measurement included any mention of reliability or validity.[7] Methodology between studies varies a great deal, including how adherence or non-adherence is defined and how observations are carried out; in addition, sufficient details concerning the methods and criteria used are often lacking.[8]

The following are some of the specific challenges to measuring hand hygiene adherence:

- Contact with patients and their environment takes place in many locations within organizations.
- Opportunities for hand hygiene occur 24 hours a day, 7 days a week, 365 days a year and involve both clinical and nonclinical staff.
- The frequency of hand hygiene opportunities varies by type of care provided, unit, and patient factors.
- Monitoring is often resource intensive; infection preventionists, quality improvement staff, and other health care workers (for example, nursing, respiratory therapy) face numerous competing demands for their time and expertise.
- Observer bias (such as the Hawthorne effect) is difficult to eliminate (as discussed in Chapter 3).

Commenting on the inherent difficulties in measuring hand hygiene adherence, Marvin Bittner, M.D., VA Medical Center, Omaha, Nebraska, described the "ideal" hand hygiene measurement method as one in which "every health care worker opportunity for hand hygiene is observed by someone who is invisible, 24 hours a day, 7 days a week, 365 days a year."[9]

Expressing concern about data collection methods, John Boyce, M.D., section chief of Infectious Diseases and director of the Hand Hygiene Resource Center at the Hospital of Saint Raphael in New Haven, Connecticut, stated that "data from poor tools can be misleading and dangerous."[10] Professor Didier Pittet, M.D., M.S., director, Infection Control Program, University of Geneva Hospitals and Faculty of Medicine, Geneva, Switzerland, and leader, WHO First Global Patient Safety Challenge, similarly commented that "a tool used as a standard for hand hygiene monitoring but providing inaccurate data could produce a false sense of security among health care workers and, therefore, could be counterproductive."[11]

It is noteworthy that several countries or regions have invested considerable resources in developing and testing standardized data collection tools and training materials for hand hygiene in order to assess the effectiveness of broad-scale improvement initiatives. Many of these materials are currently or will soon be widely available for use around the world and should be considered for use by those searching for ways to improve their measurement strategies. Using validated methods saves enormous time and resources by allowing organizations to avoid reinventing the wheel and provides strategies to obtain better data. This monograph describes several prominent initiatives.

Scope of This Monograph

The following is a brief overview of the chapters in this monograph:

- Chapter 1 discusses the CDC and the WHO-WAPS hand hygiene guidelines; it also describes other international guidelines. This chapter explains the difference between hand hygiene indications and opportunities, and discusses barriers to guideline adherence.
- Chapter 2 highlights the importance of choosing a measurement method that meets the particular organization's needs and discusses the necessary components of that assessment process, pointing out that an organization's measurement goals should drive its selection of the measurement method(s).
- Chapters 3 through 5 provide a comprehensive review of the three main measurement methods, including the advantages and disadvantages of each methodology:
  - Chapter 3 provides a detailed look at the observation method of measuring hand hygiene. The elements of hand hygiene that can be

measured are described, including issues regarding when hand hygiene will be observed, which health care workers will be observed, and who will be observing. The chapter presents the advantages and disadvantages of overt versus covert observation, the importance of observer training and reliability assessment, and how to calculate adherence rates/ratios from observational data.

— Chapter 4 reviews measurement of product use, its advantages and limitations, and the different ways to go about measuring product use.

— Chapter 5 provides an overview of using surveys to measure aspects of hand hygiene. The chapter describes the domains surveys can measure, such as staff knowledge and staff attitudes and beliefs, and explores methodological considerations.

- Chapter 6 considers the importance of assessing hand hygiene thoroughness, nail and jewelry considerations, and glove use.
- Chapter 7 describes several noteworthy international hand hygiene measurement initiatives and provides descriptions of their programs, tools, and methods.
- Chapter 8 explores ways to use and display data. The chapter also looks at the reasons the link between hand hygiene practices and health care–associated infections is difficult to establish.
- Chapter 9 describes the factors that contribute to improvement in hand hygiene practices and considers the complexities of changing behavior, as well as some improvement strategies and interventions.
- Chapter 10 provides an overview of resources from organizations participating in the project, with a list of many Web sites that provide valuable information, tools, and resources on hand hygiene measurement and improvement.
- The final section, Appendix: Examples of Measurement Tools, contains selections from several of the tools described in the monograph.

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9. Bittner M., VA Medical Center, Omaha, NE, personal communication, Nov. 8, 2007.
10. Boyce J., Hospital of Saint Raphael, New Haven, CT, personal communication, Sep. 11, 2007.
11. Pittet D., University of Geneva Hospitals, Geneva, Switzerland, and leader, World Health Organization First Global Patient Safety Challenge, personal communication, Jun. 11, 2007.

Appendix I-1.

Submissions Reviewed by the CMHH Panel

Submitting Organization	Health Care Organization Contact	Focus of Method
Amager Hospital Copenhagen, Denmark	Lisbeth Kyndi Bergen, I.C.N. e-mail: lisbeth.kyndi.bergen@hvh.regionh.dk	Technique: UV light, fluorescent ABHR
Amron Corporation McLean, Virginia	Sandy Swoboda, R.N., M.S. Johns Hopkins Hospital Baltimore, Maryland e-mail: sswoboda@jhmi.edu	Electronic monitoring
Asante Health System Medford, Oregon	Susan Binette, R.N., B.S.N. e-mail:sbinette@asante.org	Observation
Brookhaven Memorial Medical Center Patchogue, New York	Doreen Virgil, R.N., M.S.N., C.I.C. e-mail: dvirgil@bmhmc.org	Observation and measuring product use
CanBeFit Healthcare Consultants Las Vegas, Nevada	No healthcare organization contact available	Technique: pH meter
Caritas Norwood Hospital Norwood, Massachusetts	Wanda Carey, R.N., B.S.N., C.I.C. Wanda.Carey@caritaschristi.org	Measuring product use
City of London University London, England	Dinah Gould, Ph.D., M.Phil., B.Sc., R.N., R.N.T. e-mail: d.gould@city.ac.uk	Observation
Denver Health and Hospital Denver, Colorado	Connie Savor Price, M.D. e-mail : Connie.price@dhha.org	Observation
Department of Veterans Affairs National Center for Patient Safety Washington, DC	Noel Eldridge, M.S. e-mail: noel.eldridge@va.gov	Observation, measuring product use, and health care worker survey
Eastern Maine Medical Center Bangor, Maine	Dina Fenn, R.N., C.I.C. e-mail: dfenn@emh.org	Observation and measuring product use
Ecolab St. Paul, Minnesota	Kathleen Finch R.N., B.S.N., C.I.C. e-mail: kathy.finch@medstar.net	Measuring product use
Greenview Regional Hospital Bowling Green, Kentucky	Jennifer Raffaelli, R.N., B.S.N., C.I.C. e-mail: Jennifer.Raffaelli@HCAhealthcare.com	Observation
Greenville Hospital System Greenville, South Carolina	Susan Boeker, R.N., B.S.N., C.I.C. e-mail: sboeker@GHS.org	Observation, measuring product use, and patient survey
Hospital of Central Connecticut New Britain, Connecticut	Lynn Pepin, R.N., C.I.C. e-mail: lpepin@thocc.org	Observation
Jewish Hospital Cincinnati, Ohio	Azalea Wedig, B.S., I.P. e-mail: Azalea.Wedig@healthall.com	Observation
Liberty Hospital Liberty, Missouri	Jo Micek, R.N., C.I.C. e-mail: jmicek@libertyhospital.org	Observation
Mayo Clinic Rochester, Minnesota	Linda J. Grupa, M.P.H., R.N., B.S.N. e-mail: grupa.linda@mayo.edu	Observation
McGuckin Methods International (MMI) Ardmore, Pennsylvania	Karen Ray, M.T., C.I.C. Upper Chesapeake Medical Center Bel Air, Maryland e-mail: kcr.01@ex.uchs.org	Measuring product use

Appendix I-1. (continued)

Meritech, Inc. Golden, Colorado	No healthcare organization contact available	Automated hand wash stations, RFID badges
Michigan Hospital Association Keystone Center Lansing, Michigan	Kimberly Sepulvado, R.N. e-mail: KSepulvado@mha.org	Observation
Ministry of Health and Long-term Care Ontario, Canada	Tiffany Jay e-mail: handhygiene@ontario.ca	Observation
Park Nicollet Methodist Hospital St. Louis Park, Minnesota	Amy Priddy, M.S., R.N., C.I.C. e-mail: Amy.priddy@ParkNicollet.com	Observation
Reedsburg Area Medical Center Reedsburg, Wisconsin	Rita Schara, R.N., B.S.N. e-mail: rschara@ramchealth.org	Observation
Royal Free and University College Medical School London, England	Sheldon Stone, B.Sc., M.D., F.R.C.P. e-mail: s.stone@medsch.ucl.ac.uk	Observation
Saint Claire's Hospital Weston, Wisconsin	Paul J. Thomas, R.N., B.S.N., C.I.C. e-mail: paul.thomas@saintclareshospital.org	Observation
Shriners Hospital for Children Chicago, Illinois	Kim Romberg, R.N., C.I.C. e-mail: kromberg@shrinenet.org	Observation
Spartanburg Regional Health care System Spartanburg, South Carolina	Kathy Bryant, R.N., C.I.C. E-mail: kbryant@srhs.com	Observation
Sprixx Santa Barbara, California	Matthew D. Koff, M.D., M.S. Dartmouth-Hitchcock Medical Center Lebanon, Hew Hampshire e-mail: Matthew.Koff@hitchcock.org	Measuring product use
St. Joseph Health Care Lexington, Kentucky	Dana Stephens, M.T., C.I.C. e-mail: stephed@sjhlex.org	Observation and patient survey
Tripler Army Medical Center Honolulu, Hawaii	Stephen Yamada, M.S., C.I.C. e-mail: Stephen.yamada@us.army.mil	Observation (by patients)
UH Case Medical Center Cleveland, Ohio	Christine Sydenstriker, R.N., B.S.N. e-mail: Christine.sydenstricker@UHhospitals.org	Observation
UltraClenz, LLC Riviera Beach, Florida	Barbara Franklin Dana-Farber Cancer Institute Boston, Massachusetts e-mail: Barbara_Franklin@DFCI.harvard.edu	Electronic hand wash system
University Community Hospital Tampa, Florida	Jacqueline Whitaker, R.N., M.S., C.I.C. e-mail: jwhitaker@mail.uch.org	Observation and measuring product use
University of Louisville Louisville, Kentucky	Linda Goss, M.S.N., R.N., C.I.C., C.O.H.N.-S. e-mail: lindago@ulh.org	Observation
VA Medical Center Omaha, Nebraska	Marvin J. Bittner, M.D., M.Sc. e-mail: marvin.bittner@va.gov	Measuring product use
Versus Technology, Inc. Traverse City, Michigan	No healthcare organization contact available	Measuring product use
World Health Organization -World Alliance for Patient Safety Geneva, Switzerland	Claire Kilpatrick, R.N., P.G. Dip., I.C.N., M.Sc. e-mail: patientsafety@who.int	Observation and survey

Appendix I-2.

Glossary of Key Terms Used in This Monograph

Term	Definition
Adherence[1,2]	Similar to compliance, the extent to which behavior matches agreed recommendations or guidelines. This term has been adopted by many as an alternative to *compliance* in an attempt to emphasize that an individual is free to decide whether to adopt the recommended behavior.
Bias[3]	A systematic deviation of a study's result from a true value. Typically, it is introduced during the design or implementation of a study and cannot be remedied later.
Alcohol-based hand rub (ABHR)[4]	An alcohol-containing preparation (liquid, rinse, gel, or foam) designed for application to the hands to reduce the growth of microorganisms. Such preparations may contain one or more types of alcohol with excipients, other active ingredients, and humectants.
Antimicrobial soap[4]	Soap (detergent) containing an antiseptic agent at a concentration that is sufficient to reduce or inhibit the growth of microorganisms.
Antiseptic agent[4]	An antimicrobial substance that reduces or inhibits the growth of microorganisms on living tissues. Examples include alcohols, chlorhexidine gluconate, chlorine derivatives, iodine, chloroxylenol (PCMX), quaternary ammonium compounds, and triclosan.
Antiseptic hand rubbing[4]	Applying an antiseptic hand rub to reduce or inhibit the growth of microorganisms without the need for an exogenous source of water and requiring no rinsing or drying with towels or other devices.
Antiseptic hand washing[4]	Washing hands with water and soap or other detergents containing an antiseptic agent.
Clinical guideline[5]	A systematically developed statement for practitioners and participants about appropriate health care for specific clinical situations.
Compliance[1,2]	The extent to which behavior matches or conforms to recommendations or guidelines.
Confounding[3]	A situation in which relations are factually right but cannot be interpreted causally because some underlying, unaccounted-for factor is associated with both exposure and outcome.
Confounder, Confounding variable[6]	A factor that distorts the true relationship of the study variables of central interest by virtue of being related to the outcome of interest but extraneous to the study question and unequally distributed among the groups being compared. For example, age might confound a study of the effect of a toxin on longevity if individuals exposed to the toxin were older than those not exposed.
Hand antisepsis/decontamination[4]	Reduction or inhibition of the growth of microorganisms through the application of an antiseptic hand rub or through antiseptic hand washing.
Hand cleansing[4]	Performing hand hygiene for the purpose of physically or mechanically removing dirt, organic material, or microorganisms.
Hand hygiene[4]	A general term referring to any action of hand cleansing.
Hand washing[4]	Washing hands with plain or antimicrobial soap and water.
Health care–associated infection[7]	A localized or systemic condition resulting from an adverse reaction to the presence of an infectious agent(s) or its toxin(s) that occurs in a patient who is in or was in a health care setting (for example, hospital, outpatient clinic) and was not present or incubating at the time of admission unless the infection was related to a previous admission to the same setting.

Appendix I-2. (continued)

Health care worker[8]	In this monograph, synonymous with the term *health care personnel*, which was defined by the Healthcare Infection Control Practices Advisory Committee (HICPAC) to include all paid and unpaid persons working in health care settings who have the potential for exposure to infectious materials, including body substances, contaminated medical supplies and equipment, contaminated environmental surfaces, or contaminated air. These include (but are not limited to) physicians, nurses, nursing assistants, therapists, technicians, emergency medical service personnel, dental personnel, pharmacists, laboratory personnel, autopsy personnel, students and trainees, contractual staff not employed by the health care facility, and persons (for example, clerical, dietary, housekeeping, maintenance, and volunteer personnel) not directly involved in patient care but potentially exposed to infectious agents that can be transmitted to and from health care personnel or patients.
Indication[9]	The reason hand hygiene is necessary at a given moment. It is justified by a risk of germ transmission from one surface to another. It is formulated in terms of a temporal reference point, such as "before" or "after" contact.
Infection Preventionist[10]	Infection preventionists direct interventions that protect patients from healthcare-associated infections (HAIs) in clinical and other settings around the world. They work with clinicians and administrators to improve patient and systems-level outcomes and reduce HAIs and related adverse evens. (Formerly known as Infection Control Professionals prior to July 10, 2008.)
Kappa statistic[11,12]	Cohen's statistical measure of interrater agreement, which is generally thought to be a more robust measure than simple percent agreement calculation because it takes into account the agreement occurring by chance. Kappa measures the agreement between two raters who each classify *N* items into *C* mutually exclusive categories. The equation for K is $K = \frac{Pr(a) - Pr(e)}{1 - Pr(e)}$ where Pr(*a*) is the relative observed agreement among raters, and Pr(*e*) is the hypothetical probability of chance agreement. If the raters are in complete agreement, then K = 1. If there is no agreement among the raters (other than what would be expected by chance), then K < 0. For most purposes, K > .75 can be considered to represent excellent agreement beyond chance, K < .40 can be considered to represent poor agreement beyond chance, and K > .40 and < .75 can be considered to represent fair to good agreement beyond chance.
Opportunity[9]	Whenever one of the indications for hand hygiene is present and observed. Each opportunity should correspond to an action.
Visibly soiled hands[4]	Hands on which dirt or body fluids are readily visible.

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chapter 1

Hand Hygiene Guidelines: The Foundation for Measurement

Guidelines for hand hygiene are intended to promote improved hand hygiene practices that help health care institutions reduce transmission of microorganisms and the associated infections, which lead to increased morbidity, mortality, lengths of stay, and costs. The guidelines consist of specific recommendations that are based on scientific evidence and the consensus of experts in the field.[1,2] Adhering to hand hygiene guidelines is the most effective way to prevent health care–associated infections, particularly in hospital intensive care units and neonatal intensive care units, where adherence to hand hygiene guidelines tends to be lowest and patient vulnerability to infection tends to be highest.[1,3,4]

Guidelines for hand hygiene have been issued by many organizations and countries, and they are revised periodically as new evidence becomes available. It is important, therefore, to always refer to the primary issuing source in order to access the most recent version of a guideline. Some examples of hand hygiene guidelines and related documents include those issued by the following:

- Health Canada[5]
- The Centers for Disease Control and Prevention (CDC), United States[1]
- The Department of Health and Aging, Australia[6]
- National Health Service, England[7]
- The World Health Organization (WHO)[2]

The hand hygiene guidelines listed here all address the core elements of hand hygiene behaviors, including the following:

- When to perform hand hygiene
- Agents to use in hand hygiene
- Techniques for hand hygiene (depending on the agents used)
- Duration of hand hygiene
- Technique, duration, and instruments for drying hands
- Use of disposable gloves
- Wearing of artificial nails and jewelry
- How to choose hand hygiene agents
- The necessary infrastructure for optimal hand hygiene

There is a great deal of similarity across existing hand hygiene guidelines, but there are some differences as well. For example, single-use disposable paper towels are recommended for drying hands in all the guidelines, but the Australian guidelines also state that a clean cloth towel, a fresh portion of a roller towel, and use of retractable hand towels is acceptable.[6] Glove use is another area in which there is some variation among guidelines. All the guidelines recommend against the reuse of gloves. The WHO guidelines state: "Avoid reuse of gloves. If gloves are reused, implement reprocessing methods to ensure glove integrity and microbiological decontamination."[2(p. 98)] Differences among guidelines are often appropriate because of differences in the intended users of the guidelines.

There are also differences in the way guideline issuers categorize, or grade, the evidence that supports their recommendations. Appendix 1-1 presents a comparison of the CDC and WHO hand hygiene guidelines.

Factors Influencing Adherence to Hand Hygiene Guidelines

Individual clinician adherence to safe hand hygiene practices is low worldwide, despite evidence that adhering to guidelines reduces infections.[1,2,4,8,9] This lack of adherence has led to improvement initiatives by the WHO and The Joint Commission's issuance of National Patient Safety Goal 7,[10] which calls for health care organizations to follow the CDC hand hygiene guidelines; National Patient Safety Goal 7 was expanded in 2008 to also include the WHO hand hygiene guideline.[11]

Table 1-1 lists some of the factors associated with low adherence to hand hygiene guidelines. In addition to factors listed in Table 1-1, Sax et al. pointed out that poor health care worker training on why, when, and how to perform hand hygiene during routine care is also a barrier to proper hand hygiene.[12]

Hand Hygiene Indications, Opportunities, and Actions: Understanding the Terminology

The effective measurement of hand hygiene adherence requires an understanding of some basic terminology associated with the hand hygiene process. Three of the most important concepts are *indications, opportunities*, and *actions*.

Indications are the principal rationale for performing hand hygiene. Developers of hand hygiene guidelines define indications and incorporate them into written guidelines[1,13]; in turn, individual health care organizations can incorporate the guidelines into their written policies governing hand hygiene.

According to the WHO *Manual for Observers*, an indication "is the reason why hand hygiene is necessary at a given moment. It is justified by a risk of germ transmission from one surface to another. It is formulated in terms of a temporal reference point: 'before' and 'after' the contact. The indications 'before' and 'after' do not necessarily correspond to the beginning and completion of a care sequence or activity. They occur during movements between geographical areas, during transitions between tasks near patients, or some distance from them."[13(p. 7)]

Some examples of indications for hand hygiene in both the CDC and WHO guidelines include the following:

- Before patient contact
- Before starting an invasive procedure
- After contact with blood, body fluids or excretions, mucous membranes, non-intact skin, and wound dressings
- After removing gloves
- When moving from a contaminated patient body site to a clean site during care
- After contact with inanimate objects or medical equipment close to the patient
- After patient contact

When choosing a tool to measure hand hygiene adherence, it is important to be clear about which indications you want to capture. The WHO guidelines recommend that five indications be measured.[2] These five indications, which the WHO refers to as *moments*, are presented in Figure 1-1.

Opportunities represent the *points in time within the care process* when hand hygiene should be performed, as specified by the indications. An opportunity exists whenever at least one of the indications for hand hygiene is present and observed[13]; however, there can be more than one indication for a single opportunity. For example, say that a nurse completes a dressing change, removes the gloves, and leaves the patient room. The indications are (1) after contact with wound dressings, (2) after removing gloves, and (3) after patient contact. All three indications apply to one opportunity or expectation that hands should be cleaned.

Actions comprise the performance of hand hygiene. Each opportunity should correspond to an action of performing hand hygiene. "If properly carried out, the hand hygiene action implies recognition of the indications by healthcare workers during their activities and within the process they organize care."[13(p. 8)]

Table 1-1.
Barriers to Guideline Adherence

Factors influencing adherence to hand-hygiene practices

Observed risk factors for poor adherence to recommended hand-hygiene practices

- Physician status (rather than a nurse)
- Nursing assistant status (rather than a nurse)
- Male sex
- Working in an intensive-care unit
- Working during the week (versus the weekend)
- Wearing gowns/gloves
- Automated sink
- Activities with high risk of cross-transmission
- High number of opportunities for hand hygiene per hour of patient care

Self-reported factors for poor adherence with hand hygiene

- Handwashing agents cause irritation and dryness
- Sinks are inconveniently located/shortage of sinks
- Lack of soap and paper towels
- Often too busy/insufficient time
- Understaffing/overcrowding
- Patient needs take priority
- Hand hygiene interferes with health-care worker relationships with patients
- Low risk of acquiring infection from patients
- Wearing of gloves/beliefs that glove use obviates the need for hand hygiene
- Lack of knowledge of guidelines/protocols
- Not thinking about it/forgetfulness
- No role model from colleagues or superiors
- Skepticism regarding the value of hand hygiene
- Disagreement with the recommendations
- Lack of scientific information of definitive impact of improved hand hygiene on health-care–associated infection rates

Additional perceived barriers to appropriate hand hygiene

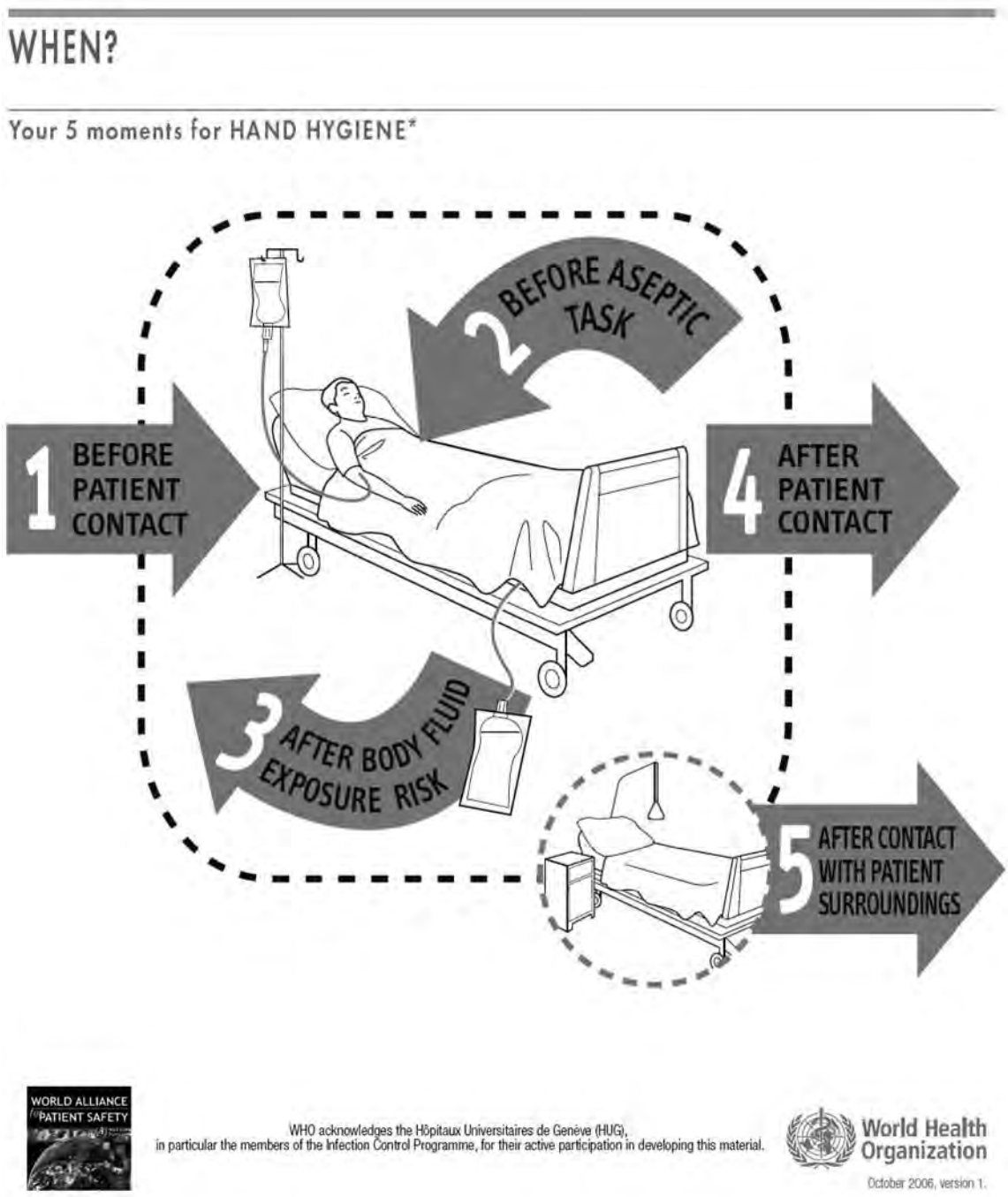
- Lack of active participation in hand-hygiene promotion at individual or institutional level
- Lack of role model for hand hygiene
- Lack of institutional priority for hand hygiene
- Lack of administrative sanction of noncompliers/rewarding compliers
- Lack of institutional safety climate

Source: *Centers for Disease Control and Prevention. Guideline for Hand Hygiene in Health-Care Settings: Recommendations of the Healthcare Infection Control Practices Advisory Committee and the HICPAC/SHEA/APIC/IDSA Hand Hygiene Task Force. MMWR. 51(RR- 16):[inclusive page numbers], 2002.*

A broad array of measurement approaches that can be applied to hand hygiene are discussed in the following chapters. The first step in determining which measurement approach will work best for you is to develop a strategy for measurement; this is the focus of Chapter 2.

Figure 1-1.

The World Health Organization's Five Moments for Hand Hygiene



Source: *World Health Organization (WHO): WHO Guidelines on Hand Hygiene in Health Care (Advanced Draft): A Summary. Geneva, Switzerland: WHO, 2006.*

Key Points, Chapter 1

- Guidelines establish the recommended practices against which performance should be measured.
- Although hand hygiene guidelines have been issued by several organizations and countries, most recommendations are consistent across guidelines.
- Indications are the principal rationale for performing hand hygiene.
- Opportunities represent the points in time within the care process when hand hygiene should be performed, as specified by the indications.
- A hand hygiene action should be performed whenever an opportunity for hand hygiene exists.

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Appendix 1-1.

World Health Organization (WHO) Hand Hygiene Guideline Recommendations: Comparison with Centers for Disease Control and Prevention (CDC) Guidelines

Recommendation	CDC Guideline*	WHO Guideline*	Key Points of WHO Guideline
I. Indications for handwashing and hand antisepsis			
A. Visible dirt, blood or body fluids on hands of health care worker (HCW)	A. (IA) Non-antimicrobial or antimicrobial soap and water	A. (IB) Soap and water	Simplifies terminology and does not differentiate between non-antimicrobial and antimicrobial soap, unless specified
B. No visible dirt, blood, or body fluids on hands of HCW in the following clinical situations:	B. (IA) Prefer alcohol hand rub or, alternatively, (IB) antimicrobial soap and water	B. (IA) Prefer alcohol hand rub or, alternatively, (IB) soap and water	
1. Before direct patient contact	1. (IB) Recommend	1. (IB) Recommend before and after contact	Clarifies expanded use of hand hygiene
2. After removing gloves	2. (IB) Recommend	2. (IB) Recommend	
3. Before handling invasive device for insertion	3. (IB) Before donning sterile gloves for central venous catheter insertion; also for insertion of other invasive devices that do not require a surgical procedure using sterile gloves	3. (IB) Before insertion of all invasive devices, regardless of glove use	Clarifies clinical situations and simplify terminology
4. After contact with blood, body fluids, mucous membranes, non-intact skin, and wound dressings	4. (IA) Recommend	4. (IA) Recommend	
5. Moving from contaminated patient body site to clean site during patient care	5. (II) Recommend	5. (IB) Recommend	
6. After contact with inanimate objects or medical equipment close to patient	6. (II) Recommend	6. (IB) Recommend	
C. Potential exposure to spore-forming organisms	C. (II) Non-antimicrobial or antimicrobial soap and water	C. (IB) Soap and water	Alcohol hand rub is ineffective against spore-forming organisms (e.g., Clostridium difficile, Bacillus anthracis)

Appendix 1-1. (continued)

Recommendation	CDC Guideline*	WHO Guideline*	Key Points of WHO Guideline
D. After using restroom	D. (IB) Non-antimicrobial or antimicrobial soap and water	D. (II) Soap and water	
E. Before handling medication or food	E. (IB) Non-antimicrobial or antimicrobial soap and water (before handling food)	E. (IB)Alcohol rub or soap and water (before handling both medication and food)	Recommends alcohol rub and expands recommendation to include medication
F. Concomitant or sequential use of alcohol rub with soap and water	F. No comment in non-surgical setting. In surgical (operating room) setting, recommend pre-washing hands with soap and water before alcohol rub (see III.G.2 below)	F. (II) Not recommended in either nonsurgical or surgical setting	Prewashing hands is not recommended
II. Hand hygiene technique (non-surgical)			
A. Alcohol hand hygiene rub	A. (IB) Apply palmful, rub thoroughly until dry. Follow manufacturer's recommendation regarding volume of product to use	A. (IB) Apply palmful, rub thoroughly until dry. See instructional diagram	Emphasizes hand hygiene technique rather than product volume and refers to diagram
B. Handwashing with soap and water. Wet hands first, wash thoroughly, rinse, dry with disposable towel, and use towel to turn off faucet	B. (IB) Wash for 15 seconds	B. (IB) Wash using vigorous rotational handrubbing technique. No time requirement. See instructional diagram	Emphasizes hand hygiene technique rather than time requirement and refers to diagram
C. Avoid use of very hot water to decrease risk of dermatitis	C. (IB) Recommend	C. (IB) Recommend	
D. Dry hands thoroughly after hand hygiene	D. Recommend (see II.A and II.B above)	D. Recommend; separate emphasis	
E. Avoid using multiuse (cloth) hand towels	E. (II) Recommend	E. (IB) Recommend	Emphasizes CDC recommendation regarding non-reuse of cloth towels by individuals
F. Use of antimicrobial-impregnated wipes as hand hygiene alternative	F. (IB) May use as alternative to non-antimicrobial soap and water. Do not use as alternative to antimicrobial soap and water or to alcohol hand rub	F. No comment	

Appendix 1-1. (continued)

Recommendation	CDC Guideline*	WHO Guideline*	Key Points of WHO Guideline
G. Use of bar, liquid, leaf or powder soaps. May use if using non-antimicrobial soap and water. Bar soap should be small size and sit on drainage rack	G. (II) Recommend	G. (II) Recommend	
III. Surgical hand preparation			
A. Remove of visible dirt before preparation	A. No comment	A. (II) Wash hands with soap and water	Emphasizes removal of visible dirt prior to surgical preparation
B. Clean fingernails using nail cleaner before preparation	B. (II) Recommend	B. (II) Recommend; clean under running water	
C. Design handwashing sink to minimize splashing	C. No comment	C. (II) Recommend	Recommends evaluating sink design; faulty faucet aerators have been associated with contamination of handwashing water
D. Remove rings, watches, and bracelets before preparation	D. (II) Recommend	D. (II) Recommend	
E. Artificial nails prohibited	E. Recommend; for high-risk patients (e.g., in intensive care unit or operating room)	E. (IA) Recommend; for direct contact with all patients	Expands prohibition of artificial nails; associated with changes in normal flora and impede proper hand hygiene
F. Type of surgical hand preparation: either antimicrobial soap and water or sustained activity alcohol rub	F. (IB) Recommend	F. (IB) Recommend; if water quality is not assured, use alcohol rub	Some areas may have water quality problems
G. Duration and technique of surgical hand preparation			
1. If using antimicrobial soap and water	1. Manufacturer's recommendation; usually 2 to 6 minutes	1. Manufacturer's recommendation; usually 2 to 5 minutes	
2. If using alcohol rub	2. (IB) No time requirement. Prewash hands with non-antimicrobial soap and water	2. (IB) No time requirement. Apply to dry hands and keep hands and forearms wet during application. Do not pre-wash hands or use alcohol rub and soap and water concomitantly or sequentially	Prewashing hands not recommended (see I.F above)

Appendix 1-1. (continued)

Recommendation	CDC Guideline*	WHO Guideline*	Key Points of WHO Guideline
H. Allow hands to dry thoroughly before gloving	I. (IB) Recommend	I. (IB) Recommend	
IV. Selection of hand hygiene agents			
A. Administrative Actions			
1. Provide HCWs with efficacious (effective) product that is less likely irritate	1. (IB) Recommend	1. (IB) Recommend	
2. Maximize acceptance and solicit input from HCWs, and include cost as factor in product selection	2. (IB) Recommend	2. (IB) Recommend	
3. Consult manufacturer's recommendation regarding possible interaction between (a) product and gloves, and (b) product and creams or lotions	3. a. (II) Recommend b. (IB) Recommend	3. a. (II) Recommend b. (IB) Recommend	
B. Dispensers			
1. Access by HCWs: location of dispensers. For alcohol rub: recommend individual pocket-sized containers for HCWs	1. Refers to alcohol rub dispensers only; accessible at entrance to patient's room, at bedside, or other convenient locations	1. (IB) Refers to both soap and alcohol rub dispensers; accessible at point of care	Clarifies terminology and encourage flexibility in location
2. Function and deliver specified product volume	2. (II) Recommend	2. (II) Recommend	
3. Alcohol rub product dispenser approved for flammable materials	3. (IC) Dispenser not specified but must store dispensers in cabinets approved for flammable materials	3. (IC) Dispenser must be approved for flammable materials	Clarifies flammability requirements for individual dispensers
4. Adding soap to partially filled dispensers for refill	4. (IA) Not recommended	4. (IA) Not recommended	Clean soap dispensers thoroughly before refilling to avoid bacterial contamination

Appendix 1-1. (continued)

Recommendation	CDC Guideline*	WHO Guideline*	Key Points of WHO Guideline
C. Skin Care			
1. Educate HCWs regarding hand hygiene practices that can reduce the risk of contact dermatitis and provide creams and lotions	1. (IA) Recommend	(IA) Recommend	Provide alternatives for HCWs with allergic or adverse reactions to product
V. Use of gloves			
A. Gloves are not a substitute for hand hygiene	A. No comment	A. (IB) Recommend	Emphasizes use of hand hygiene after gloves are removed
B. Use gloves before contact with blood and body fluids, mucous membranes and non-intact skin	B. (IC) Recommend	B. (IC) Recommend	
C. Remove gloves after contact with each patient and avoid re¬use of gloves	C. (IB) Do not reuse the same gloves (or wash them between uses) with multiple patients	C. (IB) If re-use is necessary, re¬process gloves adequately between patients	Glove reuse may be necessary in some areas. Recommends implementing a glove reprocessing method to maintain glove integrity while adequately cleaning gloves
D. Change or remove gloves if moving from contaminated to clean patient site or the environment	D. (II) Recommend	D. (II) Recommend	
VI. Other aspects of hand hygiene (nonsurgical)			
A. Use of artificial nails/extenders	A. (IA) Prohibited for high-risk patients (e.g., in intensive care unit or operating room)	A. (IA) Prohibited for all direct patient contact in all settings	Prohibition of artificial nails expanded (see III.E above)
B. Nail length (natural nails); tips must be less than 1/4 inch, or 0.5 cm, in length	B. (II) Recommend	B. (II) Recommend	
C. Wearing of rings in nonsurgical health care settings	C. Unresolved issue	C. No comment	
Outcome Measures and Performance Indicators			
A. Monitoring of hand hygiene compliance			

Appendix 1-1. (continued)

Recommendation	CDC Guideline*	WHO Guideline*	Key Points of WHO Guideline
1. Direct observation with HCW performance feedback; calculate number of hand hygiene episodes performed per number of opportunities	1. Recommend	1. Recommend	
2. Indirect monitoring			
a. Monitor volume of product used for hand hygiene	a. Calculate volume used per 1,000 patient days.	a. Estimate volume used based on nursing activities	Estimate volume instead of calculating it
b. Other monitoring	b. No comment	b. Count used paper towels	Alternative monitoring
c. Electronic monitoring	c. No comment	c. Monitor use of sinks, hand hygiene product or paper towels electronically	Alternative monitoring
d. Monitor compliance with facility policies regarding jewelry, nail polish, and artificial nails	d. Recommend nonspecific monitoring	d. Monitor compliance by direct and indirect observation, self-assessment, and patient assessment	Specific measures to monitor compliance

Source: *© 2007, Joint Commission Resources. Written by Clare F. Pegues, R.N., M.P.H., P.H.N. Edited by Barbara M. Soule, R.N., practice leader, Infection Prevention and Control.*

* **Guideline Categories**

The CDC and WHO categorize recommendations on the basis of existing scientific research, theoretical rationale, applicability, and economic impact. The WHO also includes expert consensus in their categorization.

Category IA: Strongly recommended for implementation and strongly supported by well-designed experimental, clinical, or epidemiologic studies.

Category IB: Strongly recommended for implementation and strongly supported by certain experimental, clinical, or epidemiologic studies and strong theoretical rationale.

Category IC: Required for implementation, as mandated by federal and/or state regulation or standard.

Category II: Suggested for implementation and supported by suggestive clinical or epidemiological studies or a theoretical rationale [or per the WHO a consensus by a panel of experts].

chapter 2

Developing a Strategy for Measuring Hand Hygiene

Measuring hand hygiene practice can be complex, and there is little consensus on the most effective measurement methods. This chapter addresses three important questions that will help you decide which measurement methods are best suited to your organization's purposes:

- Why do you want to measure hand hygiene practices, and what are your organization's goals?
- What elements of hand hygiene do you want to measure?
- How do you want to measure hand hygiene?

Why Do You Want to Measure Hand Hygiene Practices, and What Are Your Organization's Goals?

Health care organizations measure hand hygiene practice as part of an effort to prevent health care–associated infections and the transmission of microorganisms.[1–4] The measurement strategy, however, depends on specific organizational goals. Organization goals might include the following:

- To assess the performance of individual staff members and educate them by intervening in real time
- To periodically assess the organization's level and quality of practice for regulatory or accreditation purposes
- To measure the organization's performance within high-risk patient populations or units
- To assess the impact of a quality improvement intervention to increase adherence to hand hygiene guidelines
- To compare the health care organization's performance to that of others
- To investigate an infection outbreak
- To conduct a research project
- To improve patient and family perception of quality of care

Additional questions to consider include:

- How do we want to display and use the results?
- What reports will we need to generate?
- To whom will we report the results?
- Do we want to be able to generalize the measurement results to the entire organization?
- Do we plan to track our rates over time?
- Do we want to stratify our results (by risk, type of provider, time of day or shift, or unit/department)?

After your goals have been identified, your organization will be prepared to address the next question: What elements of hand hygiene do you want to measure?

What Elements of Hand Hygiene Do You Want to Measure?

Some of the most common elements of measurement associated with hand hygiene include the following:

- **Components** of the observed hand hygiene action, such as the following:
  - Type of supplies and products used (including running water, liquid soap, alcohol-based hand rub, paper towels, and gloves)

  - The professional affiliation of the health care worker (for example, R.N., M.D., allied health professional, volunteer)
  - The thoroughness of cleansing (for example, whether all hand surfaces are covered, whether the proper amount of the product is used, whether hands are cleansed for the recommended amount of time)
  - Whether hand hygiene is performed after removal of gloves
- **Indications**, such as the following:
  - Before patient contact
  - Before an aseptic procedure
  - After body fluid exposure risk
  - After patient contact
  - After contact with patient surroundings
- **Structural considerations**, such as the following:
  - Product availability
  - Product accessibility
  - Whether dispensers and sinks are in working order
  - Placement of dispensers
- **Product use**, such as the following:
  - Aggregated volume, quantity, or count
  - Individual counts of usage
  - Name or discipline of individual health care workers using the product
- **Adherence to policies**, such as those regarding nail length, use of artificial nails or nail extenders, and the wearing of jewelry
- **Staff knowledge** about key elements of hand hygiene practice
- **Staff competence**, such as use of appropriate technique when cleansing hands
- **Perceptions and attitudes** of health care workers regarding hand hygiene, as well as the perceptions and attitudes of others, including patients and families
- **Satisfaction** with hand hygiene practices, including the following:
  - Patient/family satisfaction with staff performance
  - Staff satisfaction with products and their availability or placement

Appendix 2-1 is a table that shows these components and which of the three measurement methods may be suitable for each.

When you have determined why and what you want to measure, you need to select a measurement method, or a combination of methods, that will meet your measurement needs.

How Do You Want to Measure Hand Hygiene?

The three most commonly used methods for measuring hand hygiene are *observation*, *product measurement*, and *surveys*. Observation of health care workers involves directly watching hand hygiene behavior and allows you to proactively record the number of hand hygiene indications, opportunities, and actions. Observation of the physical environment is useful for assessing structural considerations. With product measurement, you indirectly assess hand hygiene practice by calculating how much liquid soap, alcohol-based hand rub, and paper towels are used in a given area of the organization per patient day; through the electronic monitoring of sinks and alcohol-based hand rub dispensers[5]; or by automated counting devices. Surveys can be used to gather information on health care worker perceptions, attitudes, and practices related to hand hygiene, as well as patients' and families' attitudes and perceptions related to the hand hygiene practices of health care workers. Surveys can be administered in person, over the telephone, electronically, or on paper to health care workers, patients, and family members.

Observation, product measurement, and surveys are discussed in detail in Chapters 3, 4, and 5, respectively. Appendix 2-2 provides an overview of the strengths and weaknesses of each method. Knowing the strengths and weaknesses of each measurement method, and how they relate to your goals, will help you decide how to measure hand hygiene practice. It is also important to consider what your organization can afford in terms of staffing, cost, data collection, analysis, and reporting before choosing a method.

Using Multiple Methods to Measure Hand Hygiene

It is often useful to implement more than one measurement method at the same time. Using multiple measurement approaches makes it possible to validate your results. Because all measurement methodologies have weaknesses, the level of confidence in your findings increases if you obtain similar results when using different approaches. Researchers call this *triangulation*, or the use of more than one approach to study the same phenomenon.[6]

Another advantage to approaching measurement from multiple perspectives is that it can provide more and different information than can be extracted from any single method. For example, assessing both structural capacity (that is, the availability of products and the proper functioning of sinks and dispensers) and staff knowledge of hand hygiene guidelines and reasons for noncompliance, revealed through focus groups, allows you to better understand your facility and staff and target your interventions.

Many studies have measured the effectiveness of an improvement intervention by both observing care and measuring product. Gould pointed out that questions about the validity of direct observation can be overcome by using additional, unobtrusive methods of data collection to corroborate or refute findings.[3] These include using monitoring devices, measuring liquid soap or alcohol-based hand rub, and tracking the rates of hospital-acquired infection.

Text box 2-1 describes how a few organizations have used multiple methods to measure hand hygiene.

Text Box 2-1.

Using Multiple Methods to Measure Hand Hygiene

Infection Prevention and Control staff at Spartanburg Regional Healthcare System in Spartanburg, South Carolina, use three approaches to monitor their organization's hand hygiene practices:

- Monitoring hand hygiene practices of staff via observations done by the following:
  - Trained observers as part of the medical center's "Nurse Pride" program. These nurses observe health care workers at the patient bedside during routine care, so they see a cross-section of disciplines in the course of their observations.
  - Observation by the surveillance technician from the Infection Prevention and Control department.
- Assessing patient satisfaction with staff hand hygiene practices on a regular basis as part of an organizationwide satisfaction survey. Initially the data from the satisfaction survey indicated much lower adherence to hand hygiene guidelines than the observational data. When Infection Prevention and Control staff realized that patients did not always see staff performing hand hygiene, they began teaching staff to tell patients what they were doing and why when they wash or use alcohol-based hand rub. Once they made this change, data from the surveys began to align more closely with observational data.
- Monitoring and trending the use of soap and alcohol-based hand rub over time. Hospital staff measured the volume of products purchased from vendors in fiscal years 2006 and 2007. They noticed an increase in the amount of wall-mounted alcohol-based hand rub and pocket-size alcohol-based hand rub purchased. This increase was accompanied by observed improvements in staff hand hygiene practices, including increased use of alcohol-based hand rub.

The infection preventionist at Greenville Hospital System in Greenville, South Carolina, uses multiple methods to track staff hand hygiene activity. This multitiered system includes the following:

- Direct observation by frontline health care workers and others trained by the infection preventionist, including nurses, respiratory therapists, physical therapists, and security staff.
- Gathering of information about patients' perceptions of health care worker hand hygiene practices, using a patient satisfaction survey. The preventionist sends this survey to a random sample of inpatients and emergency department patients.
- Monitoring of hand hygiene product usage systemwide, with ounces of products used per 100 adjusted patient days routinely reported. This measurement showed a statistically

Text Box 2-1. (continued)

significant increase in the use of both hand soap and alcohol-based hand rub between 2006 and 2007.

Eastern Maine Medical Center in Bangor, Maine, also considers hand hygiene adherence from several vantage points:

- Direct observation of staff and medical students by health care workers trained by the infection preventionist.
- A brief patient survey, first conducted in the summer of 2007, repeated in 2008. Student volunteers who visited patients asked the following questions:
  - — Has anybody talked to you about hand hygiene?
  - — Do you know where the alcohol gel is?
  - — Are you seeing staff clean their hands with soap and water or gel before taking care of you?
  - — Do you feel comfortable asking your health care providers if they have washed their hands?
  - — Would you like a small bottle of alcohol hand gel?
- Housekeeping staff members collect information on the use of soap and alcohol-based hand rub. Each housekeeper uses a check sheet to document how many empty containers of soap and alcohol-based hand rub he or she replaces each shift. The supervisor sends the total amount of product used per unit per week to the hospital's infection control data coordinator, who calculates monthly data points using the number of milliliters of product used per unit, divided by the number of bed days for the same time frame for each unit.

Key Points, Chapter 2

- Before you select a measurement method, determine the answers to these key questions:
  - — Why do you want to measure hand hygiene practices, and what are your organization's goals?
  - — What elements of hand hygiene do you want to measure?
  - — How do you want to measure hand hygiene?
- The three most commonly used methods to measure hand hygiene are observation, product measurement, and surveys.
- It is often a good idea to use more than one method to measure hand hygiene at the same time as this approach can do the following:
  - — Help to validate the results
  - — Uncover additional information that can be used to identify areas in need of improvement and target interventions

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Appendix 2-1.

Components of Hand Hygiene Measurable Within the Three Major Methods

Component	Observe	Measure Product[1]	Survey[1]
Action occurred			
• Type of product, agent, and supply used	X	X	
• Professional background/discipline of health care worker (HCW) cleansing hands	X		
• Thoroughness of cleansing	X		
• Appropriate use of gloves	X	X	
Opportunity or indication			
• Single or multiple specific indications for hand hygiene	X		
• Risk of indication	X		
Structural considerations			
• Product available	X		X
• Product accessible	X		X
• Dispenser/sink works	X		X
Product use			
• Individual or aggregated volume or quantity		X	
• Individual or aggregated counts of usage		X	
• Name/discipline of individual HCW using the product		X[2]	
Nail length, artificial nails, jewelry, etc. (adherence to policy)	X		
Staff knowledge			X
Staff competence			X
Perception of health care worker behavior			
• Self-perception			X
• Perception of other health care workers			X
Satisfaction with hand hygiene			
Patient or family satisfaction with staff performance			X
Staff satisfaction with availability of products			X

1. Should generally be considered indirect or proxy measures related to the occurrence of hand hygiene.
2. Some electronic systems identify health care workers.

Appendix 2-2.

Overview of Approaches to Measuring Adherence to Hand Hygiene Guidelines

	Observation	Product Measurement	Surveys
Brief Description	People observe hand hygiene behavior and record the number of hand hygiene episodes in relation to recommended practices.	Measuring the amounts of liquid soap, alcohol-based hand rub (ABHR), paper towels, and gloves used in a particular area over a specified period of time.	Surveying health care workers about their own hand hygiene practices, knowledge, attitudes, and product satisfaction. Surveying patients and families about their attitudes and perceptions of the hand hygiene practices of health care workers.
Strengths	Can pinpoint the hand hygiene behavior of individuals.[1,2] Can assess hand hygiene technique.[1] Most reliable method for assessing adherence rates.[2]	Allows efficient monitoring of hand hygiene per patient day over time in a given unit.[1] Is not subject to selection or recall bias.[1] Is less time-consuming and less costly than other methods.[2]	Inexpensive.[1] Not resource intensive.[2] Can provide some information on compliance.[2] Focuses health care workers' attention on their own hand hygiene practices.[1]
Limitations	Awareness of observation can influence staff behavior.[1,3] Labor intensive and costly.[1,2] Requires training.[1–3] Captures only a sample of all hand hygiene opportunities.[1] Can compromise patient privacy.[1,3]	Does not reveal who is performing hand hygiene.[1] Does not assess technique.[1,3] Does not capture hand hygiene opportunities.[1,3] Cannot account for spillage, use of product for purposes other than hand hygiene, and "borrowing" between wards.[3] Can be affected by a product use by patients and families.[1] Can be difficult to correlate with observation.[2] Validity has not been well-estabished.[2]	Inadequate reliability or validity for self-respect of adherence.[1,2,4] Health care workers tend to overestimate compliance.[2] Validity depends on the quality of the survey's development and testing.

1. Haas J.P., Larson E.L.: Measurement of compliance with hand hygiene. *J Hosp Infect* 66:6–14, May 2007.
2. World Health Organization (WHO): *WHO Guidelines on Hand Hygiene in Health Care (Advanced Draft): A Summary*. Geneva, Switzerland: WHO, 2006.
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chapter 3

Observing Adherence to Hand Hygiene Guidelines

The observation method involves directly watching hand hygiene behavior and allows you to proactively record hand hygiene opportunities (based on the indications in hand hygiene guidelines) and the action of hand hygiene. According to the World Health Organization (WHO) guidelines, observation is the "gold standard" for measuring hand hygiene adherence. It is the only way to directly measure health care workers' adherence to hand hygiene guidelines.[1] As described in Appendix 2-1, observers can choose to assess various aspects of hand hygiene, such as the quality and thoroughness of hand hygiene, the accessibility and use of products and gloves, the discipline of the health care worker performing hand hygiene, and adherence with policies regarding jewelry and nail length. Importantly, observation can also create an opportunity to provide health care workers with timely feedback.

Observation is also commonly used to assess structural considerations in the environment. For example, it can be used to assess bed space to determine the percentage of clean gloves in appropriate sizes, dispensers for liquid soap or alcohol-based hand rub (either wall mounted or free-standing), and whether dispensers are functioning and dispense an appropriate amount of the product.[2]

Strengths and Limitations of the Observation Method

Each of the measurement methods covered in this monograph has strengths and limitations that you should consider as you develop your measurement goals and consider which method or methods will work best for you.

The strengths of an observation method include its ability to do the following:

- Count both opportunities for hand hygiene and the action of hand hygiene.
- Determine who practiced hand hygiene, verify when they practiced it, and monitor the quality of their hand hygiene.[2,3]
- Observe the wearing of artificial nails, nail extenders, and jewelry.[2,3]
- Provide quantitative and qualitative information about when and why failures in hand hygiene occur.
- Distinguish between hand hygiene practiced by different types of health care workers and patients or family members.

Limitations of an observation method include the following:

- It may be labor intensive and costly.[1,3]
- It requires uniformity in the selection and training of observers and in the recording of data.[1,3,4]
- It can change the behavior of staff members if they are aware that they are being observed.[3,4]
- It captures only a small sample of all opportunities for performing hand hygiene.[3]
- It can compromise patient privacy.[3,4]

Components of the Measurement Method

Selecting Which Opportunities to Measure

Based on your measurement goals, you need to determine which opportunities (that is, the points in time within a care process when hand hygiene should occur, as specified by guideline indications) and actions (performing hand hygiene in response to an opportunity) need to be observed. The WHO recommends using the five opportunities described in Figure 1-1 in Chapter 1. As you evaluate your options, you should consider the following issues that can influence hand hygiene adherence rates:

- It is important to recognize that the adherence rate you calculate is dependent on the opportunities you choose to observe. Several studies have shown how rates of hand hygiene adherence vary, based on which hand hygiene opportunities are measured (see Appendix 3-1). For example, hand hygiene adherence *before* patient care is usually worse than hand hygiene adherence *after* patient care.
- Hand hygiene opportunities vary greatly based on patient mix. From unit to unit, day to day, and clinician to clinician, the frequency of hand hygiene opportunities varies, depending on the nature of the interaction between the health care worker and the patient and health care workers' perceptions of their own risk.[5] Several studies have looked at variation in adherence rates based on the intensity of patient care and the frequency of patient contact (see Appendix 3-2).
- High intensity of patient care has been associated with lower hand hygiene adherence in a multivariate analysis.[6–9] The intensity of patient care—that is, the activity index—is the estimated or expected number of hand hygiene opportunities that occur per hour. In addition, in many studies, higher patient workload—that is, a greater number of hand hygiene opportunities based on higher patient-to-staff ratios—has been associated with poorer compliance (see Appendix 3-2).

It is important for the actions being measured to be appropriately related to the opportunities you choose to observe. "The action is considered necessary provided it corresponds to at least one indication."[14(p. 8)] Therefore, actions that occur in the absence of the specific indications or opportunities being measured should not be included in the numerator of a rate.

Finally, in order to be useful, your observation must be conducted in a standardized and consistent manner. If your goal is to track improvement in hand hygiene adherence over time, or to compare the performance of a specific unit or facility against the performance of others, then the approaches used to measure and calculate the adherence rate must be identical. Comparisons that are based on non-standardized measurement can lead to faulty conclusions and bad decisions.

Deciding What Aspects to Observe

A first step in planning to observe the hand hygiene performance of health care workers is to decide which aspects of hand hygiene you want to observe and measure. Observation allows you to determine which hand hygiene products are used, the thoroughness of cleansing, the use of gloves, and whether staff are performing hand hygiene whenever there is an opportunity to do so. Observation also allows you to determine whether the product used is appropriate for the risk of transmission (for example, not using alcohol-based hand rub when there is an outbreak of *Clostridium difficile*).

Type of Product or Agent Used

You can observe whether health care workers use soap and water or alcohol-based hand rub in gel, foam, or liquid form to clean their hands. Observing the type of products used may help you to identify health care workers' preferences or changes in preferences following a change in products or in the availability of products (such as adding more alcohol-based hand rub dispensers in patient rooms).

Thoroughness of Cleansing

Observing the thoroughness of hand cleansing includes the following:

- Observing whether all surfaces of the hands and fingers are covered

- Observing whether the proper amount of product is used
- Observing whether hand rubbing occurs for the proper amount of time (that is, when washing hands with soap and water, the Centers for Disease Control and Prevention guidelines recommend rubbing hands together for at least 15 seconds[10]; when cleansing hands with alcohol-based hand rub, guidelines recommend rubbing hands together until the hands are dry)

When health care workers use soap and water to clean their hands, you can observe whether they dry their hands using clean towels, as guidelines recommend. When they do not have access to automatic sinks, you can observe whether they turn off the faucets with a paper towel.

Studies have shown that health care workers often perform hand hygiene for very short periods of time and often fail to cover all surfaces of their hands and fingers.[10,11] To increase adherence to and awareness of hand hygiene guidelines, some organizations have incorporated hand hygiene performance into annual competency reviews for staff.

More information on assessing the thoroughness of hand hygiene is available in Chapter 6.

Glove Use

In addition to technique, guidelines point out that health care workers must use gloves properly, as gloves can become contaminated during care.[1,10] Aspects of glove use that can be observed include the following:

- Gloves are worn when indicated (that is, when contact with blood or other potentially infectious material is anticipated or when contact with excretions, secretions, mucous membranes, and non-intact skin could occur).
- Gloves are changed when indicated (that is, gloves are removed after caring for a patient or when moving from a contaminated body site to a clean body site).
- Gloves are removed properly (so as not to contaminate hands in the process of removal).

Glove use does not take the place of hand hygiene.[1,10] The Institute for Healthcare Improvement (IHI) recommends assessing staff competency with hand hygiene technique and glove use; the IHI's *How-to Guide: Improving Hand Hygiene* recommends that 10 clinical staff be randomly selected from diverse disciplines each month (or at an interval specified by organization policy) so they can be observed to see whether they perform the three key hand hygiene procedures correctly: hand washing, application of alcohol-based hand rub, and use of gloves, including removing them so as not to contaminate hands in the process.[2] While this step can be time-consuming, it allows for direct evaluation of staff and the opportunity to provide immediate feedback. It also provides the opportunity to ensure that staff are not wearing artificial nails or extenders and that they have trimmed nails. This process would also work well in a staff "competency day" setting, where staff have dedicated time to perform various procedures or complete written tests to show their proficiencies. (For more information, see Chapter 6.)

Determining Who to Observe

You can collect data during hand hygiene observations of health care workers according to their discipline:

- Nurses, nursing assistants, orderlies, physicians, medical residents, pharmacists, and therapists (pulmonary, physical, occupational, and speech therapists)
- Technicians/technologists (lab, radiology, EKG/EEG, pharmacy)
- Nonclinical staff (administrative assistants, office staff, unit clerks)
- Environmental staff (engineering, maintenance, housekeeping)
- Pastoral care, social workers, discharge planners
- Food service staff
- Transporters
- Vendors
- Students, visitors, patient sitters, parents/guardians

Collecting hand hygiene data by staff discipline can help you target and tailor interventions aimed at improving

hand hygiene practices. Several researchers have studied adherence to hand hygiene by health care worker discipline. Much of this literature shows higher adherence among nurses than physicians and among female physicians than male physicians, though other researchers have had different findings (see Appendix 3-3).

Hand hygiene observation can also be directed toward patients. Poor patient hand hygiene can contribute to patient infections. To determine whether patient hand hygiene is an underlying problem, you need to observe their hand hygiene behavior. One hospital that identified an infection concern believed to be related to patient hand hygiene is described in Text Box 3-1.

Conducting Observations

Once you have determined the opportunities and actions you will observe, you need to develop a plan for conducting your observations.

Dealing with "Double Counting" Opportunities

It is essential that observers be able to determine what qualifies (that is, what should be counted) as an opportunity or an action. Opportunities and actions must be operationally defined to ensure that an accurate tally can be kept.

In addition, the act of "double-counting" can present a conundrum. This issue arises when a health care worker appropriately performs hand hygiene after contact with one patient and then goes directly to another patient to provide care without again performing hand hygiene. Technically, the health care worker has not performed hand hygiene "before" contact with the second patient, but he or she has practiced adequate infection control. Alternatively, if the health care worker leaves the room or moves between two patients in the same room without performing hand hygiene after the first encounter—but does perform hand hygiene before the second encounter—the guideline has been followed but would not be counted as such.[12,13] If your hand hygiene observation protocol measures hand hygiene both before and after each patient contact, it is worth considering how this would be addressed as the observers collect their data. Some programs that have addressed this issue are described in Text Box 3-2.

Determining When and How Frequently to Observe

Deciding when and how frequently to observe health care workers conducting hand hygiene depends on your reasons for monitoring and the resources you have at your disposal. For example, the frequency of monitoring for quality improvement may be different from the frequency of monitoring for regulatory purposes. Some organizations perform observations daily, while others conduct them weekly, monthly, or quarterly. If you want to monitor performance over time, be sure your measurement periods allow for long-term trending of data. If you are concerned

Text Box 3-1.
Observing Patients

Shriners Hospital for Children in Chicago is a short-term, 60-bed pediatric facility that provides medical, surgical, and rehabilitative care for children with orthopedic conditions. The infection preventionist noticed an increase in patients with urinary tract infections at the end of 2006. Many of the hospital's patients have neurogenic bladders and require intermittent self-catheterization. At the same time, the spinal cord injury coordinator wanted to trial a new "no touch" type of catheter. Their efforts were combined and resulted in a urinary tract initiative that included a survey asking patients and caregivers how they performed catheterizations at home. They learned that many did not clean their hands before performing the procedure. The two nurses involved their nursing staff in the initiative, and staff observed patients and caregivers performing the procedure to assess their technique. They taught patients proper hand hygiene techniques, stressed the importance of performing hand hygiene before every procedure, and provided each patient with individual bottles of alcohol-based hand rub. The initiative was successful in decreasing the incidence of urinary tract infections in this patient population.

Text Box 3-2.

Avoiding Double Counting

The Ontario, Canada, "Just Clean Your Hands" program instructs observers that when a health care worker moves directly from one patient to another, this should be recorded as two indications within one opportunity (e.g. after patient contact and before patient contact). (See http://www.justcleanyourhands.ca/program_overview.php.)

Researchers in the United Kingdom have included directions on how to avoid double counting in their instructions on using their observation tool, specifying that "hand hygiene opportunities should not be double-counted. If a healthcare worker is observed moving directly from one hand hygiene opportunity to another, without any intervening opportunities, this should be classified as one 'after' opportunity and not as an 'after' and as a 'before' opportunity." (See Hand Hygiene Observation Tool (HHOT) and instructions available at: http://www.idrn.org/nosec.php; shorter summary version at http://www.npsa.nhs.uk/cleanyourhands/in-hospitals.)

about an outbreak in a particular unit or department, the frequency of your observations will probably increase for a period of time but then revert back to your usual monitoring when the outbreak has resolved. Consider your resources as you make decisions about observing (time for collecting, collating, and reporting).

It is important to collect hand hygiene observations during a variety of weekday, weekend, and holiday shifts in order to get a complete picture of hand hygiene practices. Experts recommended planning observation activities across 24 hours to get a complete picture.[4] This can be done roughly in proportion to the expected number of opportunities for hand hygiene across shifts. For example, you may need fewer observations on nights and weekends because there are fewer opportunities for hand hygiene. One study showed that adherence is worst during weekdays and mornings, when the activities requiring hand hygiene are more frequent.[6]

Determining How Many Observations Are Needed

The WHO *Manual for Observers* recommends observing a minimum of 200 opportunities during each measurement period in each department or ward to allow for meaningful comparison before and after hand hygiene improvement interventions.[14] This number is suggested to ensure that the number of opportunities observed is sufficient to draw valid conclusions within groups. However, it should be noted that 200 is not an exact or required number for all purposes. You might want to consult a statistician to determine sample size calculations specific to your needs. The main point is that small sample sizes tend to yield findings that are not as reliable as larger samples.

Researchers have pointed out that the number of observations conducted is often much too low when compared with the number of opportunities for hand hygiene. This is one of the major limitations of using observation to measure adherence. Van de Mortel et al. explained it this way: If one conservatively estimates 10 opportunities for hand hygiene per patient per hour in the intensive care unit, and multiplies that by the number of patients and the number of hours per day, one can estimate the number of opportunities per day. Then one can compare that to the proportion of opportunities actually observed.[15] For example, 12 patients times 10 opportunities per patient per hour times 24 hours per day patients yields 2,880 opportunities per day, or almost 86,500 opportunities per month. If for your routine monitoring each month you observe 100 opportunities in the intensive care unit, you are only measuring one-tenth of 1% (0.12%) of all opportunities in a given month. Imagine how small the percentage would be if you included in the calculation the total number of patients in your health care organization rather than just intensive care patients.

Determining Where to Measure: Structuring and Scheduling Your Observations

Deciding where to measure depends on your reason for measurement. The priority settings for observation are often based on surveillance and prevalence data, which can change based on infection rates and outbreaks. You can learn a great deal about how to design your own approach to observing hand hygiene by learning how previous observation studies have been designed, including the details of methodology, how observation periods were selected, who did the observing, and how observers were trained. Several of these studies are described in Appendix 3-4.

For organizationwide monitoring, it can be helpful to have a structured schedule for selecting settings. Text Box 3-3 contains a hypothetical sampling framework for selecting units and time frames for observation.

Selecting a Sample of Health Care Workers or Patients to Observe

The purpose of sampling is to be able to take a limited number of observations and be reasonably confident that

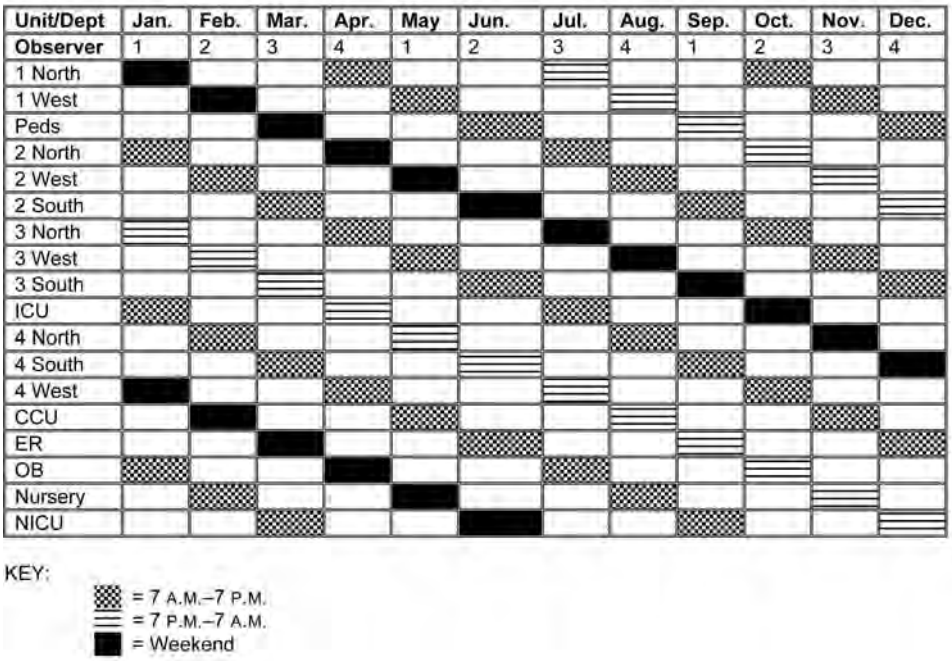
Text Box 3-3.

Sample Observation Schedule

Janet, an infection preventionist, wants to observe staff hand hygiene behavior four times a year in each of the nursing units. For each unit, she wants to conduct one-half of the observations between 7 A.M. and 7 P.M., one-fourth between 7 P.M. and 7 A.M., and one-fourth on weekends. She has trained three staff members in how to conduct the observations, based on the Center for Disease Control and Prevention's 2002 guidelines and indications for hand hygiene. Each observer watches hand hygiene opportunities on each of the assigned units every month, using a form Janet adapted from the WHO's World Alliance for Patient Safety hand hygiene data collection form. The observer records each hand hygiene opportunity for each staff member observed and then records whether hand hygiene was performed. Janet has assigned units for the current year according to the following schedule:

Observer 1: Sue
Observer 2: Nancy
Observer 3: Chris
Observer 4: Janet

Janet will analyze observations according to the discipline of the caregiver and the shift/day of week each was observed.



they represent the larger population of interest. An important decision to consider is whether a sample needs to be representative of the larger population. There are a number of approaches to selecting a sample of locations and/or health care workers, including random sampling, convenience sampling, and quota sampling. Additional information on sampling strategies is provided in Appendix 3-5.

Determining Who Will Conduct Observations

Infection Preventionists

In many organizations, infection preventionists observe hand hygiene and collect information about performance. Using infection preventionists as observers has advantages and disadvantages:

Advantages:

- Infection preventionists have knowledge of hand hygiene guidelines.
- They can intervene and teach on the spot to correct unacceptable hand hygiene performance and may require less training on guidelines than other personnel.
- They can provide immediate feedback to staff for good hand hygiene performance.

Disadvantages:

- Staff recognize infection preventionists, which makes it difficult for them to observe without health care workers' awareness. Staff awareness can result in a Hawthorne effect, where a individuals' knowledge of observation causes them to change their behavior and makes it difficult to observe "true" hand hygiene performance. The Hawthorne effect is described in more detail later in this chapter.
- Having infection preventionists conduct observation prevents ownership of unit staff in monitoring hand hygiene.

Other Personnel

Instead of using infection preventionists, another approach to data collection is to engage staff from across the facility to perform observations. This can promote widespread acceptance of, ownership of, and participation in activities to improve hand hygiene. It can also be an eye-opening experience for staff regarding the true level of hand hygiene adherence. In addition, observer training should increase staff knowledge of hand hygiene guidelines and heighten their awareness that hand hygiene is an organizational concern, not just something for which the infection preventionist or quality improvement department is responsible. However, it is sometimes not a good idea to use staff as observers within their own departments because they might be inclined to rate their coworkers better than outside observers would, thus biasing the data.[3]

Text Box 3-4 provides some examples of ways in which infection preventionists have involved staff in their organizations to observe hand hygiene performance.

Patients

In some organizations, patients are asked to provide information on health care worker hand hygiene. (Using patients as observers is not the same as using patients to remind health care workers to perform hand hygiene, which is a commonly used strategy for improvement; that strategy is described in more detail in Chapter 9.) Using patients as observers may be most effective in settings such as ambulatory care, in which patients are relatively healthy and where independent observers are rarely used. Keep in mind that staff need to know they should perform hand hygiene in front of a patient; the patient will not see hands being cleansed if it is done outside a patient's field of vision.

It can be a challenging to include some patient populations, such as patients who are cognitively impaired, critically ill, or unable to speak the common language. In addition, patients can assess only basic indications, such as hand hygiene performed before and after care. Nicol and Watkins noted that health care workers who do not perform hygiene upon leaving a patient room may do so in another location prior to contact with another patient; in such cases, failure to perform protocols to the letter may not necessarily be the same as failure to perform hand hygiene.[12]

Text Box 3-4.

Engaging Staff to Observe Hand Hygiene

There are two hospitals in Asante Health System in Medford, Oregon: the 365-bed Rogue Valley Medical Center and the 125-bed Three Rivers Community Hospital. From 2005 to 2007, these two organizations used "safety representatives" to observe hand hygiene performance, following an initial one-on-one orientation with the patient safety coordinator. At that time, Rogue Valley Medical Center had 35 safety representatives, and Three Rivers Community Hospital had 18. Each organization held two to four group retraining sessions, which encompassed various topics, including hand hygiene, at the safety representatives' periodic meetings. The representatives conducted random covert observations on their own units or departments, each observer submitting data on 20 to 40 health care worker observations per quarter. They made an effort to conduct some observations on night shifts and weekends.

Liberty Hospital in Liberty, Missouri, is a 245-bed community hospital that has been monitoring hand hygiene since 2003. Initially, the infection preventionist and light-duty personnel observed the hand hygiene practices of health care workers in various care settings. They decided, however, that the observations did not adequately represent hand hygiene practices hospitalwide, so they decided in 2004 to organize a group of trained staff from approximately 20 different departments or units to conduct observations during their regular work hours. These individuals were named "The Germinators." Each Germinator was trained in recognizing hand hygiene opportunities and how to use the data collection tool. They were also trained to give feedback to staff on lapses in hand hygiene technique and held practice sessions to make them more comfortable giving both positive and negative feedback. The Germinators noted the activity the health care worker was involved in when hand hygiene was not performed, which has provided valuable feedback to the infection preventionist: She found early on that most staff thought they should cleanse their hands only after patient contact, not after contact with the patient's environment. Feedback such as this allowed the infection preventionist to focus her hand hygiene education efforts during the hospital's annual education days. Each Germinator collects data on at least 10 observations in his or her unit or department each month; more than 800 observations are collected organizationwide per quarter. This responsibility for monitoring hand hygiene is considered in each Germinator's annual evaluation and merit increase.

Jewish Hospital in Cincinnati, Ohio, is a 200-bed suburban teaching hospital. In their effort to evaluate staff hand hygiene performance, the infection preventionists developed and began to use a hand hygiene monitoring tool to record the observations of trained patient safety leaders from approximately 20 departments or units in late 2003. Each patient safety leader conducts 15 to 20 observations per month. If an observer sees a hand hygiene infraction, he or she informs the person being observed immediately; if the observer is uncomfortable providing this feedback, the observer informs the department or unit manager, who provides feedback to the staff member. The observers send their completed hand hygiene monitoring forms to the chairperson of the patient safety leaders, who forwards them to the infection preventionist. The infection preventionist sends quarterly reports to the infection control, patient safety, and environment of care committees, as well as to each department manager. At these meetings, committee members discuss recommendations for improvement and develop improvement plans based on their recommendations; committee meeting minutes document all follow-up work. Hand hygiene monitoring is only one of the safety-related activities for which patient safety leaders are responsible; they also educate staff about a variety of aspects of safety, act as role models, and conduct other safety audits.

Text Box 3-5 describes how one organization implemented a process of engaging patients as observers of staff hand hygiene practices.

Overt Versus Covert Observation

Observations can be overt, with health care workers being aware that they are being observed, or covert, with health care workers either being unaware that they are being observed or unaware that they are being observed as part of hand hygiene monitoring. There are advantages and disadvantages to both overt and covert observation.

Overt observation allows for access to staff, immediate feedback, and staff education. Overt observations can be done by following, or "shadowing," staff, or they can be less

Text Box 3-5.

Patients as Observers of Staff Hand Hygiene

Tripler Army Medical Center in Honolulu, Hawaii, is a 231-bed teaching facility and the largest Army medical treatment facility in the Pacific Basin. In January 2007, Tripler's hand hygiene initiative, named the Semmelweis Project, began in a single hospital outpatient clinic. Because most patients are seen behind closed doors and cannot be observed by colleagues, the medical center decided to try using patients to observe staff hand hygiene practices. The goal of this project has been to enhance staff performance of hand hygiene in front of patients before providing care. When patients register at the clinic, they are given a 3 x 5 card that reads on one side as follows:

Be Involved in Your Care!

- Using soap and water or alcohol rubs is one of the ways that helps us to prevent the spread of germs.
- Please observe our health care provider to see if they wash or use the alcohol rub before providing your care.
- Take an active part in your care by completing the reverse side of this card and placing it in the receptacle in the reception area.

The other side of the card is the observational tool, with the name of the clinic and date, a place to select the type of health care worker the patient will be seeing (physician, nurse, or other) and a place to checkmark next to "yes" or "no" for "performed hand hygiene."

The participating clinic keeps track of the number of cards it gives to patients. Patients complete the forms and place them in the receptacle at the reception desk approximately 58% of the time. The infection preventionist collects the cards, aggregates the data, provides monthly feedback to the clinic, and produces a monthly report for the Performance Improvement Council.

Tripler Army Medical Center Infection Control and Epidemiology Program Manager Stephen Yamada and Guy Dickinson, Lead Medical Support Assistant, Adult Medicine Clinic, demonstrate how patients return their hand hygiene observation cards to the receptacle.

The infection preventionist says this method serves five purposes:

- It helps to educate patients about the importance of hand hygiene.
- It empowers patients to be active participants in their care.
- It attempts to improve health care providers' adherence to hand hygiene guidelines.
- It fosters a culture within the medical center in which routine hand hygiene becomes the norm.
- It helps to validate the data staff collect from internal observations.

To date, Tripler has expanded this patient observation method to an additional five clinics, with plans to add five more.

obtrusive, with the observer maintaining some distance from the staff. With overt observation, however, the Hawthorne effect can occur. The Hawthorne effect refers to the tendency of people who know they are being observed in a research context to behave differently from the way they would otherwise behave, thereby impacting the results (also see Text Box 3-6).[16] There is ample evidence that the Hawthorne effect will have an impact on data if staff are aware that they are being observed. A number of studies that have considered this impact are summarized in Appendix 3-6. Some suggest that the Hawthorne effect can be advantageous; the notion that "big brother is watching you" should be promoted in a cost-effective way if it achieves improved adherence and lower infection rates.[17]

Text Box 3-6.
The Hawthorne Effect

The effects of observation on the activity being studied were documented initially during productivity experiments at the Hawthorne Western Electric Plant in Cicero, Illinois, in the 1930s. The researchers noticed that, regardless of the variable being manipulated, job performance improved when workers were being observed.[18]

Covert observation, such as using "secret shoppers," tends to minimize the Hawthorne effect but does not provide an opportunity for immediate staff feedback. Covert observation can also result in missed observations of hand hygiene opportunities if the observer is stationary, such as when he or she is sitting at a desk. In research studies, covert observation can also have potentially negative ethical implications because staff are not being informed of the observation or are given misleading information about its purpose[4]; some believe the secret shopper method of covert observation can create a lack of trust.[19]

However, one organization that used secret shoppers for covert observations found this to be a very useful approach that had a positive impact on staff and their hand hygiene adherence. This organization's story is described in Text Box 3-7.

Text Box 3-7.
Using Secret Shoppers in a Hospital

When The Methodist Hospital in Houston, Texas, decided to monitor hand hygiene adherence among staff, it elected to use observers who were not hospital staff but outside consultants, infection prevention and control experts hired by the hospital to observe staff hand hygiene practices. These trained observers wore hospital badges and otherwise looked like hospital staff, but their sole purpose was to see whether staff cleansed their hands when they should. They observed physicians, nurses, and ancillary staff as they performed their normal activities, with two-thirds of their observation on weekdays between the hours of 7 A.M. and 7 P.M., and one-third on weekends and between the hours of 7 P.M. and 7 A.M. The hospital began collecting data this way in 2006, when leadership undertook a comprehensive effort to improve quality and wanted to avoid the bias that can result from using an organization's own staff.[20].

Privacy Considerations

It's important to take patient and health care worker privacy issues into account when planning and carrying out all observations. The importance of privacy issues is recognized in the following observer training materials:

- The WHO notes in its *Manual for Observers* the importance of patient privacy. The manual states, "Observation does not justify infringing the principle of patient privacy. This means observers show discretion regarding where they place themselves and their movements."[14(p. 25)]
- Ontario's hand hygiene program's instructions for observers state, "The observer must conduct observations openly, without interfering with the ongoing work, and keep the identity of the healthcare providers confidential." There are no identifiers or names recorded on their observer tool. (See http://www.justcleanyourhands.ca.)

Using Technology in Observations

Observing staff members' hand hygiene behavior using technology such as video cameras is an unobtrusive way to collect data. There is less selection bias with this method, but bias is not completely eliminated; the range of cameras can be limited, and it is possible that the cameras will not "see" all dispensers. You can use cameras either randomly or continuously, but purchasing and installing the equipment can be expensive, and someone will need to review the stored data and interpret and record what they see. In addition, cameras can interfere with the privacy of both staff members and patients, and not all indications are recorded by this technology.[3]

A group of Japanese researchers studied the hand hygiene practices of individuals entering the intensive care unit at Osaka University by using continuous video camera surveillance. Hospital policy requires all health care workers and visitors to cleanse their hands before entering the inten-

sive care unit. Video cameras were mounted on the ceiling, near two sets of sensor-regulated automatic doors and hand hygiene stations at the intensive care unit's only entrance. An infrared alarm sensor was located on the ceiling, close to the first automatic door, and a person passing under this sensor triggered the video recorder to begin recording. The researchers conducted the recordings for one week. Staff and visitors were not aware of the study or the purpose of the video cameras. There were 1,030 entries to the intensive care unit during the observation period. While visitors performed hand hygiene 94% of the time, intensive care unit staff did so only 71% percent of the time and non-intensive care unit staff did so only 74% of the time. The researchers used this information to provide feedback to staff on the importance of hand hygiene.[21]

Standardizing Observation

The Importance of Observer Training and Assessing Reliability

Infection preventionists have reported very different hand hygiene rates for the same units, depending on the role and training of the observer.[3] This influence can be minimized by thorough training and a clear, consistent definition of what to observe. Any observation includes an inherent observer bias, which is the extent to which the observer inaccurately identifies or measures a phenomenon. Vandenbroucke et al. define *bias* as a systematic deviation of a study's result from a true value that is usually introduced during the design or implementation of a study and cannot be corrected after the fact.[22] Proper training can sometimes require hours; training associated with major initiatives such as the "Just Clean Your Hands" program in Ontario (described further in Chapter 7), can take 4 to 6 hours.

In addition to training, it also helps to provide detailed written instructions with the observation form. This ensures that observers will have at hand all the information necessary to conduct their observations in a standardized way and thus maintain the reliability of the process. The following are examples of observation tools submitted for the Consensus Measurement in Hand Hygiene (CMHH) project that include detailed instructions (see Appendix: Examples of Measurement Tools):

- Ontario, Canada's "Just Clean Your Hands" observation tool
- Reedsburg Area Medical Center's "Hand Hygiene Observation Tool"
- U.K. researchers' "Hand Hygiene Observation Tool" (HHOT)
- The U.S. Department of Veterans Affairs "Hand Hygiene/Glove Use Observational Tool"
- World Alliance for Patient Safety "Observation Form"

To determine whether training has been effective and whether there is consistency in data collection, you should also consider assessing reliability among observers, if more than one observer will be collecting data. Reliability among observers is often referred to as *interrater reliability* or *inter-observer reliability*. After two or more observers observe and document the same event, interrater reliability is determined by comparing the amount of agreement or disagreement in their assessments or measurements.[23]

One initiative that measured interrater reliability is described in Text Box 3-8.

Documenting Your Methods

When reporting hand hygiene results, it is important to completely describe the methodology used for data collection.[4] Reported details of the observation should include interrater reliability if there is more than one data collector, the vantage point of the data collectors, and attempts undertaken to overcome the Hawthorne effect.

Determining How to Calculate Adherence Rates

Generally, when observation is used to measure hand hygiene adherence, "the action is compared with the opportunity."[14(p. 8)] The result is called the *adherence rate*, and it is typically calculated as follows:

$$\frac{\text{Total number of acts of hand hygiene when the opportunity existed}}{\text{Total number of hand hygiene opportunities}}$$

Adherence rates can be calculated in a variety of ways. Understanding the impact of using different rate calculations is important as you make decisions about how you

Text Box 3-8.

Interrater Reliability Testing

Researchers in the United Kingdom developed and tested the reliability of an observation tool as part of a national study of feedback effectiveness. They published their detailed assessment in 2008.[24] To determine interobserver agreement for individual hand hygiene opportunities and subsequent hand hygiene behavior, two trained observers watched identical hand hygiene opportunities in six two-hour-long observation sessions. These observations took place in an intensive care unit and an acute care ward at one London hospital. The observers sat near each other in the bed areas but not close enough to see each other's data collection forms. Each of the 298 observed opportunities was recorded on a separate observation form. After each opportunity was observed and recorded, the observers would confer to determine whether they had observed and documented the same opportunity. Raw agreement (percent) and kappa (see the glossary in Appendix I-1 for more information on kappa) were 77% and 0.68 for observed hand hygiene behavior; 83% and 0.77 for hand hygiene opportunities assessed; and 90% and 0.77 for the type of health care worker observed.

The researchers also evaluated interobserver agreement for overall hand hygiene adherence, with 4 trained observers conducting 19 hours of observation (1,191 opportunities observed). Working in pairs during 1-hour observation periods, the observers sat near each other so they had the same vantage point; each observer recorded multiple events on one data collection form. At the end of the 1-hour period, each observer calculated the overall assessment of health care workers' hand hygiene adherence. Overall agreement was good (interclass correlation coefficient = 0.79).

In addition, study participants demonstrated that the tool was sensitive to change. Researchers assessed this by having a trained observer in an intensive care unit for 1 hour per day over the course of several months, during which an outbreak occurred and the emphasis on hand hygiene was increased. The tool helped researchers to detect the increase in hand hygiene adherence.

will interpret and use your observation data. There are three primary calculation types, or measures:

- Item-by-item measures
- Composite measures
- All-or-none measures

A brief description of each is presented here; a more in-depth review is available elsewhere.[25]

Item-by-Item Measures

Item-by-item measures allow you to look at hand hygiene adherence for opportunities related to a single indication. When calculating this kind of rate, the denominator is the total number of opportunities for a given indication. The numerator is the total number of hand hygiene actions observed when the opportunity is present. For example, if you observed hand hygiene behavior using an approach that was consistent with the WHO's Five Moments for Hand Hygiene (see Chapter 1), you would calculate item-by-item rates as follows:

$$\frac{\text{\# of observed hand hygiene actions before patient contact}}{\text{\# of hand hygiene opportunities observed before patient contact}} \times 100$$

and

$$\frac{\text{\# of observed hand hygiene actions before aseptic task}}{\text{\# of hand hygiene opportunities observed before aseptic task}} \times 100$$

and

$$\frac{\text{\# of observed hand hygiene actions after body fluid exposure risk}}{\text{\# of hand hygiene opportunities observed after body fluid exposure risk}} \times 100$$

and

$$\frac{\text{\# of observed hand hygiene actions after patient contact}}{\text{\# of hand hygiene opportunities observed after patient contact}} \times 100$$

and

$$\frac{\text{\# of observed hand hygiene actions after contact with patient surroundings}}{\text{\# of hand hygiene opportunities observed after contact with patient surroundings}} \times 100$$

Composite Measures

A composite measure is a compilation of multiple indications into a single adherence rate. You calculate this type of measure by dividing the sum of observed actions (numerator) by the sum of observed opportunities (denominator). It is important to note that this type of calculation gives partial credit for incomplete care or performance, as some caregivers might have performed hand hygiene for some, but not all, of the opportunities observed. So, if you observed hand hygiene behavior, you would calculate a composite rate as follows:

$$\frac{\{(\text{\# of observed hand hygiene actions before patient contact}) + (\text{\# of observed hand hygiene actions before aseptic task}) + (\text{\# of observed hand hygiene actions after body fluid exposure risk}) + (\text{\# of observed hand hygiene actions after patient contact}) + (\text{\# of observed hand hygiene actions after contact with patient surroundings})\}}{\{(\text{\# of hand hygiene opportunities observed before patient contact}) + (\text{\# of hand hygiene opportunities observed before aseptic task}) + (\text{\# of hand hygiene opportunities observed after body fluid exposure risk}) + (\text{\# of hand hygiene opportunities observed after patient contact}) + (\text{\# of hand hygiene opportunities observed after contact with patient surroundings})\}} \times 100$$

All-or-None Measures

All-or-none measures calculate adherence rates by applying the "all-or-none" rule at the patient level: Either all hand hygiene opportunities are addressed by corresponding actions or they are not. If a health care worker is expected to perform hand hygiene at each opportunity within his or her environment, the observer would note whether the health care worker performed hand hygiene at all hand hygiene opportunities within each patient encounter. If a health care worker performed hand hygiene before patient contact and after body fluid exposure risk, but not after patient contact, the health care worker would be recorded as not having performed hand hygiene appropriately. To calculate an all-or-none adherence rate, use the following formula:

$$\frac{\text{\# of patient encounters observed where hand hygiene was performed at all opportunities (\textit{before patient contact, before aseptic task, after body fluid exposure risk, after patient contact and after contact with patient surroundings})}}{\text{\# of patient encounters during which at least one opportunity was observed}} \times 100$$

This method of calculating hand hygiene adherence is philosophically closer to reflecting the interests of patients, where violation of a single aspect of hand hygiene can result in cross-contamination and patient infection. It also fosters a system perspective, with concern for the total patient care episode, not isolated parts. This is the approach that the IHI recommends in its *How-to Guide: Improving Hand Hygiene*.[2] Hand hygiene adherence rates are calculated as complete episodes of patient care—an all-or-nothing adherence measurement; *all* aspects of hand hygiene and glove use must be performed correctly during a patient encounter. This raises the bar, recognizing that, from the patient's perspective, anything less than complete adherence is unacceptable. Another benefit of the IHI tool is that it permits direct calculation of rates on the data collection form. However, it can be difficult and time-consuming to observe complete patient contacts from start to finish, especially when patient privacy issues are considered.

The following is a simple example that illustrates how calculating the rates differently affects the outcome.

Scenario: An infection preventionist observed 100 separate encounters between nurses and patients to determine adherence to the guidelines. She found that hand hygiene was performed *before patient contact* in 50 of 100 encounters, *before aseptic task* in 10 of 15 encounters, *after body fluid exposure risk* in 30 of 32 encounters, *after patient contact* in 60 of 100 encounters, and *after contact with patient surroundings* in 10 of 45 encounters. Hand hygiene

Text Box 3-9.

Examples of All-or-None Calculation Method

Mayo Clinic in Rochester, Minnesota, comprises two large inpatient hospitals with a combined 1,600 beds and a large primary and subspecialty practice that have teaching programs for medical students, nurses, and allied health professionals. Their "Hand Hygiene and Glove Use Monitoring Form" was developed initially as part of a research study and later simplified and adapted for use in the IHI's *How-to Guide: Improving Hand Hygiene*.[2] The form captures the type of health care worker, the nature of the contact (patient or environment and whether hand hygiene was done before contact), and glove usage (whether required, whether used, and whether hand hygiene was done after gloves were used). A scoring section for each observation tallies the adherence score for each encounter as "all or none"; for example, if hand hygiene was done before patient contact *and* after removal of gloves, the adherence score would be "yes"; if, however, hand hygiene was done before patient contact but not after removal of gloves, the adherence score would be "no." The form, which can capture up to 30 observations, also permits calculation of an overall adherence rate.

The University of Louisville Hospital in Louisville, Kentucky, is a 404-bed teaching hospital associated with the University of Louisville. The "Hand Hygiene and Glove Use Monitoring Form" is available for the infection control liaisons who do the observations to use in either paper form or on a personal digital assistant (PDA). As with the Mayo Clinic form, the overall adherence rate is either "yes" (hand hygiene is done in all situations where indicated) or "no" (hand hygiene is done in some but not all situations where indicated).

was performed at all opportunities during 25 of the 100 total encounters.

Using the alternative methods for calculating rates, we come up with the following percentages:

Item by item:

- 50/100 *before patient contact* opportunities = 50% adherence rate
- 10/15 *before aseptic task* opportunities = 66.6% adherence rate
- 30/32 *after body fluid exposure risk* opportunities = 93.8% adherence rate
- 60/100 *after patient contact* opportunities = 60% adherence rate
- 10/45 *after contact with patient surroundings* opportunities = 22.2% adherence rate

Composite:

- (50 + 10 + 30 + 60 + 10) actions / (100 + 15 + 32 + 100 + 45) total opportunities = 160 actions / 292 total opportunities = 54.8% composite adherence rate

All-or-none:

- 25 encounters where all eligible hand hygiene actions were performed / 100 encounters = 25 / 100 = 25% all-or-none adherence rate

Two organizations that submitted their measurement method for evaluation as part of the CMHH project and that use the all-or-none approach to calculating adherence rates are described in Text Box 3-9.

Key Points, Chapter 3

- Observation is the only way to directly measure health care worker adherence to hand hygiene guidelines.
- Adherence rates will vary depending on which indications are measured, by whom, and in which patient populations, as well as by the method used for calculating rates.
- Spending time and effort in training data collectors and selecting user-friendly forms with clear instructions will greatly enhance the accuracy and credibility of the measurement results.

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Appendix 3-1.

Examples of Research Articles That Compare Adherence Rates on Opportunities for Different Indications

Article	Opportunities Measured	Findings
Bahal A., et al.: Hand hygiene compliance: Universally better post-contact than pre-contact in health care workers in the UK and Australia. *British Journal of Infection Control* 8(1):24–28, 2007.	Before and after patient contact.	The patterns of post-contact adherence and non-adherence strongly suggest that hand hygiene (HH) practice in both study countries is primarily self-protective rather than a patient safety–centered practice (better after patient care than before patient care).
Novoa A.M., et al.: Evaluation of hand hygiene adherence in a tertiary hospital. *Am J Infect Control* 35:676–683, Dec. 2007.	Before or after patient contact.	A total of 1,254 opportunities for HH were observed in 247 staff members: • 12.8% before patient contact • 25.6% after patient contact
Eckmanns T., et al.: Compliance with antiseptic hand rub use in intensive care units: The Hawthorne effect. *Infect Control Hosp Epidemiol* 27:931–934, Sep. 2006.	Before and after patient care procedures (such as care of catheters, wounds, ventilation care, urinary catheters, ventricle drainage; preparation of intravenous solutions; and any direct patient contact).	Observations were made during two observation periods (first one covert, second one overt): • Covert, before procedures/contact: 24% • Covert, after procedures/contact: 35% • Overt, before procedures/contact: 31% • Overt, after procedures/contact: 47%
Wendt C., Knautz D., von Baum H.: Differences in hand hygiene behavior related to the contamination risk of health care activities in different groups of health care workers. *Infect Control Hosp Epidemiol* 25:203–206, Mar. 2004.	HH opportunities, based on the 15-item Fulkerson scale in intensive care units (ICUs) and general nursing wards.	During the study period, 2,138 observations were made, with nearly two-thirds of the observations occurring on general nursing wards. Health care workers (HCWs) on general wards tended to perform HH more frequently (72.4%) than those in the ICUs (51.8%).
Bischoff W.E., et al.: Handwashing compliance by health care workers: The impact of introducing an accessible, alcohol-based hand antiseptic. Arch Intern Med 160:1017–1021, Apr. 10, 2000.	Before and after all events with high risk of microbial transmission, including contact with mucous membranes, non-intact skin, secretions or excretions; and manipulations of vascular lines or other tubes.	This study included observation of 1,575 HH opportunities in one medical ICU, one cardiac surgery ICU, and one general medical ward. HH adherence before and after an intervention in the medical intensive care unit showed improvement in HH adherence after the introduction of

Appendix 3-1. (continued)

Article	Opportunities Measured	Findings
Bischoff (cont.)		alcohol-based hand rub (ABHR) at each patient bed: • Baseline, before patient contact: 10% • Baseline, after patient contact: 22% • Post-intervention, before patient contact: 23% • Post-intervention, after patient contact: 48%
Pittet D., Mourouga P., Perneger T.V.: Compliance with handwashing in a teaching hospital. Ann Intern Med 130:126–130, Jan. 19, 1999.	Type of patient care activity: • After each patient contact • Between care of a dirty and a clean body site • After contact with body fluid • Before and after intravenous care, wound care, respiratory care, and urinary care • After glove removal • After indirect patient contact or hospital maintenance	In this study, of 2,834 observed opportunities for HH, adherence was lower: • Before IV care: 39% • Before respiratory care: 18% • Care between a dirty and clean body site: 11% Adherence was higher: • After contact with body fluid: 63% • After wound care: 58%
Watanakunakorn C., Wang C., Hazy J.: An observational study of hand washing and infection control practices by health care workers. Infect Control Hosp Epidemiol 19:858–860, Nov. 1998.	After performing various patient care activities: • Examining the patient • Emptying urine bag • Bathing the patient • Suctioning or wound care • Inserting intravenous lines • Wound care	The overall prevalence of HH was 30.2% (207 of 686 opportunities). HH was performed more often for some activities than others: • Examining the patient: 47.5% • Emptying urine bag: 44.1% • Bathing the patient: 83.3% • Suctioning: 20.7% • Wound care: 23 % • Inserting intravenous lines: 33.3%
Thompson B.L., et al.: Handwashing and glove use in a long-term-care facility. Infect Control Hosp Epidemiol 18:97–103, Feb. 1997.	Before, during, and after patient contact.	In this observational study of 230 staff in a long term care facility, staff washed their hands when indicated in 189 patient interactions, as follows: • 27% before patient contact • 0% during patient care • 63% after patient contact

Appendix 3-2.

Examples of Research Articles That Examine Adherence by Intensity, Frequency, Risk of Opportunity, and Other Factors

Article	Health Care Setting	Measure of Intensity, Risk, etc.	Health Care Worker Adherence
Rupp M.E., et al.: Prospective, controlled, cross-over trial of alcohol-based hand gel in critical care units. Infect Control Hosp Epidemiol 29:8–15, Jan. 2008.	Two intensive care units (ICUs)	Overall, 12.3 opportunities per hour were recorded across both ICUs.	Rates of hand hygiene (HH) adherence in the two study periods: ICU 1: • 38% when no alcohol-based hand rub (ABHR) was available • 69% when ABHR was available ICU 2: • 37% when no ABHR was available • 68% when ABHR was available
Novoa A.M., et al.: Evaluation of hand hygiene adherence in a tertiary hospital. Am J Infect Control 35:676–683, Dec. 2007.	Hospitalwide cross-sectional study	Health care worker (HCW) activities were classified according to risk: • High risk: Prior to any patient contact • Intermediate risk: After patient exam, wound contact, aseptic technique, contact with bedpan • Low risk: Before/after environmental contact	Rates of HH adherence by risk of cross-infection: • Low risk: 13.9% • Intermediate risk: 31.8% • High risk: 13.7% The findings suggested that HCWs perform HH for their own protection rather than to protect the patient.
Eckmanns T., et al.: Compliance with antiseptic hand rub use in intensive care units: the Hawthorne effect. Infect Control Hosp Epidemiol 27:931–934, Sep. 2006.	Five ICUs in two university hospitals	Number of opportunities per hour: • Covert observation period (observer was stationary at charting area): 9.4 opportunities per hour. • Overt observation period (observer mobile, followed HCWs during procedures): 18.7 opportunities per hour.	Rates of HH adherence in the two periods: • Covert observation period: 29% • Overt observation period: 45%
Larson E.L., Albrecht S., O'Keefe M.: Hand hygiene behavior in a pediatric emergency department and a pediatric intensive care unit: comparison of use of 2 dispenser systems. Am J Crit Care 14:304–311, Jul. 2005.	Two units at a large pediatric hospital: • Emergency department • Pediatric intensive care unit (PICU)	• Study personnel observed 5,568 indications for HH over 306 hours of observation, for an average of 18.2 indications per hour. • HH occurred in 2,136 of those observed, for a mean of 7.0 episodes per hour. • The mean number of indications for HH per patient was significantly greater in the PICU than in the emergency department (6.12 vs. 5.16 indications, respectively; P=.02).	• Rates of adherence did not differ significantly between the emergency department and the PICU (35% vs. 41%, respectively; P = .07).

Appendix 3-2. (continued)

Article	Health Care Setting	Measure of Intensity, Risk, etc.	Health Care Worker Adherence
Lam B.C., Lee J., Lau Y.L.: Hand hygiene practices in a neonatal intensive care unit: a multimodal intervention and impact on nosocomial infection. Pediatrics 114:e565–e571, Nov. 2004.	Neonatal intensive care unit (NICU) in a university hospital	High-risk procedures, HH before and after: • Invasive procedure; wound, mucous membrane or body fluid contact • Administration of intravenous fluids • Suctioning • Prolonged patient contact (bathing, changing linen, physiotherapy, etc) Low-risk procedures, HH before and after: • When giving oral medications • Administration of tube feedings • Skin contact (touching, holding)	Rates of HH adherence before the researcher's educational intervention with staff: Before (and after) patient contact: • High risk procedures: 35%, (41%) • Low risk procedures: 43%, (37%) Rates of HH adherence after the intervention: Before (and after) patient contact: • High risk procedures: 60%, (71%) • Low risk procedures: 49%, (51%) HH improved over the two study periods, but HH after high-risk procedures remained higher than that for low-risk procedures.
Pittet D., et al.: Hand hygiene among physicians: Performance, beliefs, and perceptions. Ann Intern Med 141:1–8, Jul. 6, 2004.	Hospital wards throughout a large teaching hospital	Physician workload, estimated by the number of observed opportunities for HH per hour of patient care for each physician observation (activity index). Level of risk for cross-transmission: • High risk for cross-transmission: Prior to patient care or between dirty and clean site on same patient; before intravenous or arterial care; before urinary, respiratory, or wound care • Medium risk for cross-transmission: After contact with patient; after intravenous or arterial care; after urinary, respiratory, or wound care after contact with body fluid • Low risk for cross-transmission: Other conditions	Rates of HH adherence by physician workload: • < 5 opportunities per hour: 63.3% • > 5 opportunities per hour: 52% Rates of HH adherence by risk: • Low-medium risk: 62.9% • High risk: 36.9% Opportunities for HH related to high-risk for cross-transmission and those related to high workload were associated with reduced adherence.
Wendt C., Knautz D., von Baum H.: Differences in hand hygiene behavior related to the contamination risk of health care activities in different groups of health care workers. Infect Control Hosp Epidemiol 25:203–206, Mar. 2004.	General wards and ICUs in a teaching hospital	Risk of contamination, 15-point Fulkerson scale, ranking contacts from clean to dirty: • "Clean" activities: rank 1–7 • "Dirty" activities: rank 8–15 HH adherence, general ward vs. ICU.	The lowest use of ABHR among all staff occurred after contact with items that had had no patient contact, and the highest use occurred after contact with feces. High rates of ABHR use by nurses was observed after contact with sterile materials (low-risk activity), whereas physicians had a high use of ABHR after contact with excretions (high-risk activity). HH compliance was higher on regular wards (72.4%) than in the ICUs (51.8%), believed to have been due to the higher workload during care of critically ill patients.

Appendix 3-2. (continued)

Article	Health Care Setting	Measure of Intensity, Risk, etc.	Health Care Worker Adherence
Bittner M.J., et al.: Limited impact of sustained simple feedback based on soap and paper towel consumption on the frequency of hand washing in an adult intensive care unit. Infect Control Hosp Epidemiol 23:120–126, Mar. 2002.	Two ICUs in a Veterans Affairs Medical Center	Nurse staffing ratios (workload) and their impact on estimated hand washing episodes (EHWEs) was studied. Estimated hand washing episodes (EHWEs), calculated by weighing the soap and towels at each sink at the beginning and end of each four-hour observation session. Using a regression model that employed changes in soap and towel weight, they calculated EHWEs that corresponded to the changes in soap and towel weight.	In the two study ICUs, EHWE decreased when the occupied bed-to-nurse ratio increased.
O'Boyle C.A., Henly S.J., Larson E.: Understanding adherence to hand hygiene recommendations: the theory of planned behavior. Am J Infect Control 29:352–360, Dec. 2001.	Adult ICUs and post-ICUs in four metropolitan hospitals in the Midwest	• Estimates of adherence to HH recommendations, via observation and self-report • Relationship among motivation, adherence and intensity of nursing unit activity • Test of an explanatory model for HH adherence based on the theory of planned behavior	• HH adherence via observation was highest for "after completion of care" (87.08%) and "after direct contact with body substances" (87.12%). • Overall adherence rate was 70% across the 1,246 indications for HH. • The association between self-reported and observed HH adherence was positive but low. • Intensity of activity in the units at the time of observation was significantly and negatively associated with adherence to HH (lower adherence when units were busier). • Observed HH action was predicted only when the activity of the nursing unit was a variable.
Pittet D., Mourouga P., Perneger T.V.: Compliance with handwashing in a teaching hospital. Ann Intern Med 130:126–130, Jan. 19, 1999.	Sample of various clinical staff in different hospital wards in a large teaching hospital: • Medical ward • Surgical ward • Obstetrics/gynecology ward • Pediatrics • Intensive care	Example of variation in number of opportunities per hour: • Pediatrics: 24.4 opportunities per hour • Intensive care: 43.4 opportunities per hour Risk of contamination, based on the 15-point Fulkerson scale, ranking contacts from clean to dirty: • High risk: Prior to patient care or between dirty and clean site on same patient • Medium risk: After contact with patient; after	Rates of HH adherence by ward: • Medical ward: 52% • Surgical ward: 47% • Obstetrics/gynecology ward: 48% • Pediatrics: 59% • Intensive care: 36% Rates of HH adherence by risk of contamination: • High risk: 38% • Medium risk: 49% • Low risk: 52% Rates of HH adherence based on the intensity of patient care (activity index): • < 20: 58%

Appendix 3-2. (continued)

Article	Health Care Setting	Measure of Intensity, Risk, etc.	Health Care Worker Adherence
		contact with body fluid; after patient care • Low risk: Activity involving indirect pt contact or hospital maintenance Intensity of patient care (estimated by the number of opportunities for HH per observation period, referred to as the activity index).	• 21–40: 51% • 41–60: 40% • > 60: 37% When the intensity exceeded 10 opportunities per hour, the compliance decreased on average by 5% (±2%) for every additional 10 opportunities. Overall, HH adherence was lower in intensive care wards than in other wards; higher-risk activities were associated with low adherence to hand washing; and adherence was worse when the activity level was high.
Pittet D., et al.: Effectiveness of a hospital-wide programme to improve compliance with hand hygiene. Lancet 356:1307–1312, 2000.	Seven hospitalwide observation periods were conducted from 1994 to 1997. Data were obtained from 2,629 prespecified 20-minute observation sessions throughout the day and night. A hospitalwide multimodel HH improvement program with an emphasis on bedside use of alcohol-based hand disinfection was implemented in January 1995. The program included customized unit-level posters, strong staff engagement, performance feedback, and individual bottles of hand gel.	Risk of contamination, based on the 15-point Fulkerson scale, ranking contacts from clean to dirty: • High risk: Prior to patient care or between dirty and clean site on same patient • Medium risk: After contact with patient; after contact with body fluid; after patient care • Low risk: Activity involving indirect patient contact or hospital maintenance Intensity of patient care (estimated by the number of opportunities for HH per observation period, referred to as the activity index).	Data were obtained on 20,082 opportunities. There was a significant improvement in compliance in the ICU and medical and surgical wards, with nonsignificant trends in obstetrics/gynecology and pediatrics units. Compliance rates were lower in high-risk activities than medium- or low-risk activities, however all groups improved significantly over time. Intensity of patient care was constant during the study period and significantly improved over time at all levels of demand
Larson E.L., et al.: A multifaceted approach to changing handwashing behavior. Am J Infect Control 25:3–10, Feb. 1997.	Two ICUs: • ICU 1 (interventional unit) • ICU 2 (control unit)	Number of opportunities per hour: • ICU 1: 8.7 opportunities per hour • ICU 2: 8.8 opportunities per hour	Rates of HH adherence by unit: ICU 1: • 56% at baseline • 76% at follow-up ICU 2: • 55% at baseline • 65% at follow-up

Appendix 3-2. (continued)

Article	Health Care Setting	Measure of Intensity, Risk, etc.	Health Care Worker Adherence
Meengs M.R., et al.: Hand washing frequency in an emergency department. Ann Emerg Med 23:1307–1312, Jun. 1994.	Emergency department in a tertiary referral teaching hospital	Risk of contamination, 15-point Fulkerson scale, ranking contacts from clean to dirty: • "Clean" activities: rank 1–7 • "Dirty" activities: rank 8–15 Gloves used, break in technique defined as not performing HH after removing gloves and proceeding to another patient or activity Number of HH opportunities per hour: 11.7	Rates of HH adherence by clean vs. dirty vs. gloved activities: • Clean activity: 18.4% • Dirty activity: 50% • Gloved activity; 64.8% Comparison of gloved and ungloved contacts showed that the use of gloves increased hand washing frequency significantly ($p < 0.0001$). The authors thought this may be due to the desire to remove powder that remains on their hands after glove removal.

Appendix 3-3.

Examples of Research Articles That Compare Adherence Rates by Category of Health Care Worker

Author/Article	Description	Category of Health Care Worker	Findings
Rupp M.E., et al.: Prospective, controlled, cross-over trial of alcohol-based hand gel in critical care units. Infect Control Hosp Epidemiol 29:8–15, Jan. 2008.	This was a two-year, prospective, controlled, crossover trial of alcohol-based hand rub (ABHR) in 2 adult medical-surgical units in a university-associated tertiary care teaching hospital in Nebraska. Hand hygiene (HH) was observed in health care workers (HCWs) in both units, before and after ABHR was made available.	• Nurses • Physicians • Others (allied health personnel)	A total of 3,678 opportunities for HH were identified. While HH adherence improved after the introduction of ABHR, differences between the different categories of HCWs were still noticeable in the two units: • Nurses: 66% (unit 1) 74% (unit 2) • Physicians: 82% (unit 1) 67% (unit 2) • Others: 63% (unit 1) 6% (unit 2)
Trick W.E., et al.: Multicenter intervention program to increase adherence to hand hygiene recommendations and glove use and to reduce the incidence of antimicrobial resistance. Infect Control Hosp Epidemiol 28:42–49, Jan. 2007.	This was a prospective study of three intervention hospitals and a control hospital in Illinois over a three-year period. Both the intervention and control hospitals introduced or increased the availability of ABHR; the intervention hospitals also had educational programs and developed a poster campaign. Study personnel conducted at least 4	• Nurses • Physicians • Others	The researchers observed 6,948 HH opportunities in the three intervention and one control hospitals. Adherence rates over the study period in the four hospitals were: • Nurses: 42% • Physicians: 39% • Others: 20%

Appendix 3-3. (continued)

Author/Article	Description	Category of Health Care Worker	Findings
	hours of observation in three units in each hospital per month, with observation periods done on all shifts for 60 minutes each.		
Rosenthal V.D., Guzman S., Safdar N.: Reduction in nosocomial infection with improved hand hygiene in intensive care units of a tertiary care hospital in Argentina. Am J Infect Control 33:392–397, Sep. 2005.	HH was observed in two intensive care units (ICUs) in a hospital in Argentina before and during the implementation of a HH program. Trained staff observed HH practices at random times twice a week, including all work shifts, for 30-minute intervals during the two periods.	• Nurses • Physicians • Ancillary staff	A total of 4,347 opportunities were identified in HCWs. Overall, HH adherence improved significantly between the two periods (23.1% to 64.5%, $p < .0001$). As with many other studies, adherence among physicians was lower than among other HCWs: • Nurses: 59.6% • Physicians: 30.8% • Ancillary staff: 37.1%
Wendt C., Knautz D., von Baum H.: Differences in hand hygiene behavior related to the contamination risk of health care activities in different groups of health care workers. Infect Control Hosp Epidemiol 25:203–206, Mar. 2004.	This observational study was done in general wards and ICUs in a large teaching hospital in Germany between January and September 2000. Multiple trained observers noted each patient contact and ranked each on the 15-item Fulkerson scale.	• Nurses • Physicians	During the study period 2,138 observations were made. Overall, nurses had higher adherence with HH indications (67.9%) than physicians (57.5%).
Pittet D., Mourouga P., Perneger T.V.: Compliance with hand washing in a teaching hospital. Ann Intern Med 130:126–130, Jan. 19, 1999.	Observations were completed in a sample of 48 different wards (medical, surgical, obstetrics/gynecology, pediatric ward, and ICU) in a teaching hospital in Switzerland during a two-week period in December 1994. Five trained infection preventionists (IPs) conducted 20-minute observation periods distributed randomly during the day and night over 14 days.	• Nurses • Physicians • Nursing assistants • Others	The study observers recorded 2,834 opportunities for HH among 1,043 HCWs, with much variation in HH adherence within different categories of HCWs: • Nurses: 52% • Physicians: 30% • Nursing assistants: 47% • Others: 38%
Pittet D., et al. Effectiveness of a hospital-wide programme to improve compliance with hand hygiene. Lancet 356:1307–1312, 2000.	Seven hospitalwide observation periods were conducted from 1994 to 1997. Data was obtained from 2629 prespecified 20-minute observation sessions throughout the day and night. A hospitalwide multimodel HH	• Nurses • Physicians • Nursing assistants • Other HCWs	Data were obtained on 20,082 opportunities. The distribution of opportunities according to HCW type remained similar over time, with nurses contributing a mean of 68.8%, nursing assistants 18.0%, physicians 8.3%, and other HCWs 4.9%. There was a significant

Appendix 3-3. (continued)

Author/Article	Description	Category of Health Care Worker	Findings
	improvement program with an emphasis on bedside use of alcohol-based hand disinfection was implemented in January 1995. The program included customized unit-level posters, strong staff engagement, performance feedback, and individual bottles of hand gel.		difference in the amount of improvement by type of HCW. Though nurses' and nursing assistants' compliance rose significantly, average compliance remained low among physicians and other HCWs, with no significant trends over time. However, physicians did switch from hand washing to using hand gel.
Watanakunakorn C., Wang C., Hazy J.: An observational study of hand washing and infection control practices by health care workers. Infect Control Hosp Epidemiol 19:858–860, Nov. 1998.	During a six-week period, a medical student conducted an observational study in an Ohio teaching hospital. This trained observer recorded whether the HCWs washed hands after performing various patient care activities (e.g., examining the patient, emptying urine bag, suctioning or wound care, inserting intravenous lines).	• Nurses • Residents • Attending physicians • Others	Overall adherence to HH was 30.2% (207 of 686 opportunities), but there were marked differences between the categories of HCWs, with a surprisingly higher adherence rate for residents and attending physicians: • Residents: 59.2% • Attending physicians: 37.4% • Nurses: 32.5% • Others: 4.2%
Meengs M.R., et al.: Hand washing frequency in an emergency department. Ann Emerg Med 23:1307–1312, Jun. 1994.	This observational study was conducted solely in the emergency department of a large tertiary care private teaching hospital in Indiana over a four-week period. Patient contacts and activities for each emergency department staff member were recorded during three-hour observation periods. Data were collected during day and evening shifts, both weekday and weekend.	• Nurses • Residents • Staff physicians	Out of the 409 total HH opportunities observed, HH occurred 32.2% of the time. Nurses practiced HH more often than residents or attending staff: • Nurses: 58.2% • Residents: 18.6% • Staff physicians: 17.2%

Appendix 3-4.
Examples of Structured Approaches for Observations

Researcher(s)	Study Setting/Design	Observation Periods	Observation Methodology	Observers	Comments
Rupp M.E., et al.: Prospective, controlled, cross-over trial of alcohol-based hand gel in critical care units. Infect Control Hosp Epidemiol 29:8–15, Jan. 2008.	Two general adult medical-surgical intensive care units (ICUs) at a university-associated tertiary care teaching hospital in Nebraska, from August 1, 2001, to September 30, 2003.	Observations were done in 20-minute increments over 2-week periods, every 60 days, for the duration of the study.	Unobtrusive observations were done on the two units. Because the observers had regular duties in the ICUs, it was not apparent to health care workers (HCWs) when hand hygiene (HH) observations were being done. The location of observations was determined by randomization of the room numbers.	Ten trained individuals (six infection preventionists [IPs], four trained assistants) participated as observers. Ninety percent of an individual's assessments had to agree with an IP's before that person could participate as an observer.	A total of 17,994 minutes of observation were done over the study period, with 3,678 HH opportunities recorded. Adherence rates improved after the introduction of alcohol-based hand rub (ABHR) (from 37% to 68% in one unit and from 38% to 69% in the other).
Trick W.E., et al.: Multicenter intervention program to increase adherence to hand hygiene recommendations and glove use and to reduce the incidence of antimicrobial resistance. Infect Control Hosp Epidemiol 28:42–49, Jan. 2007.	Prospective study in three intervention hospitals and a control hospital in Illinois over a three-year period. Objective was to monitor the adherence to HH and glove use recommendations and the incidence of multiple–drug-resistant organisms (MDRO) in clinical cultures. Both the intervention and control hospitals introduced or increased the availability of ABHR; the intervention hospitals also had educational programs and developed a poster campaign.	• Study personnel conducted at least four hours of observation in three units in each hospital per month. • Observation periods lasted 60 minutes. • Observations were done on all shifts.	• Observers considered each HCW–patient encounter as a single opportunity for HH. • An encounter included HCW contact with a patient or an environmental surface in the patient's room. • Only single observations of any individual HCW were permitted (to avoid bias in the study resulting from multiple observations of any single HCW). • To control for increased awareness of the observer by HCWs being observed, the order in which each HCW was	• Three observers (not infection control staff) were trained by the same person. • Interrater reliability required 80% agreement among the observers as to whether HH had occurred for an entire observation period before unsupervised observations were permitted. • Training included tours of the observation units and discussions about each data element.	Observers recorded 6,948 HH opportunities during 1353 observation sessions. Both glove use and adherence to hand hygiene improved significantly in the intervention hospitals (74%, 80% and 77%) but not at the control hospital (59%)

Appendix 3-4. (continued)

Researcher(s)	Study Setting/Design	Observation Periods	Observation Methodology	Observers	Comments
			observed was recorded (first HCW observed, second HCW observed, etc).		
Larson E.L., Albrecht S., O'Keefe M.: Hand hygiene behavior in a pediatric emergency department and a pediatric intensive care unit: Comparison of use of 2 dispenser systems. Am J Crit Care 14:304–311, Jul. 2005.	Crossover intervention trial in an emergency department and a pediatric intensive care unit (PICU) at a large pediatric hospital over a four-month period. The frequency of HH episodes was measured by using both direct observation and electronic counters in dispensers.	• Study personnel conducted 1-hour observations, for a total of approximately 15 hours per week. • Observations were done on day and night shifts.	• For each observation in a unit, the research assistant took a vantage point that permitted observation of the maximum number of contacts between patients and staff. For most observation periods, two to five patients and their surroundings were captured in the data collected. • Staff member HH observations were recorded without identifiers, using the eight indications in the CDC's 2002 HH guideline.	• Three research assistants • Before the study began, interrater reliability was established between the investigators and the research assistants to ensure more than 95% agreement.	A total of 306 hours of observation were completed (split evenly between the two units). Most of the observations took place on the day shift (272/306, 88.9%). Total adherence rates did not differ significantly between the emergency department and the PICU.
Lam B.C., Lee J., Lau Y.L.: Hand hygiene practices in a neonatal intensive care unit: a multimodal intervention and impact on nosocomial infection. Pediatrics 114:e565–e571, Nov. 2004.	Study was conducted over two four-week periods in the 12-bed neonatal intensive care unit (NICU)of a hospital in China: • First study period: baseline data collection. • Second study period: 6 months after the conclusion of an intervention that included HH education,	Observations occurred on daytime shifts. A target NICU patient was randomly selected by drawing lots before each observation period, which lasted 8 hours. All staff who contacted the target patient were observed; visitors were also observed.	Overt observation occurred under the guise of medical students collecting data on the activities in the NICU. For each observed contact with the target patient, there were two opportunities for HH that were recorded separately: before and after. Data were recorded using a standard computer-based data form and included details of	• The observer had one week of training to become familiar with the NICU procedures and setting. • The consistency of observations was validated by checking on selected episodes immediately after each observation period by one of the authors.	First observation period: • 666 patient contacts over 234 patient hours were observed. • Average number of contacts per patient per hour was 2.8. Second observation period: • 317 patient contacts over 174 patient hours were observed. • Average number of contacts per patient per hour was 1.8 (possibly due to enhanced clustering of

Appendix 3-4. (continued)

Researcher(s)	Study Setting/Design	Observation Periods	Observation Methodology	Observers	Comments
	enhancement of a minimal handling protocol and clustering of care, and liberal provision of ABHR. The interventions occurred over a 12-month period.		each patient (number of indwelling lines/tubes). HH technique was also assessed, using a checklist of 15 essential steps for hand washing.		patient care). HH compliance before patient contact during the first study period was 40%; it improved to 53% in the second study period.
Pittet D., et al.: Hand hygiene among physicians: Performance, beliefs, and perceptions. Ann Intern Med 141:1–8, Jul. 6, 2004.	Cross-sectional study of physician practices, attitudes, and beliefs on HH in a teaching hospital in Switzerland over a six-month period. All 1,266 physicians (staff physicians, fellows, residents, and medical students) who were practicing were eligible for inclusion in the study and were informed by mail prior to the onset of the study.	Observations were distributed throughout the hospital over the study period in order to allow the observer to obtain a balanced distribution of observation periods in the organization.	Individual physicians were observed during routine patient care; each was observed only once. Each physician completed a self-report questionnaire on cognitive factors related to HH immediately after the observed patient contact. Opportunities for HH were stratified into three categories (high, medium, and low risk for cross-transmission).	A hospital epidemiologist recorded all potential opportunities among selected physicians.	The study included more than 125 hours of observation; 163 physicians were observed during 573 patient care episodes; this provided 887 opportunities for HH with 57% HH adherence. Adherence differed between medical specialties.
Wendt C., Knautz D., von Baum H.: Differences in hand hygiene behavior related to the contamination risk of health care activities in different groups of health care workers. Infect Control Hosp Epidemiol 25:203–206, Mar. 2004.	General wards and ICUs in a large teaching hospital in Germany between January and September 2000.	Observations were performed on all shifts and on all days of the week, though most occurred on weekdays during the day shift.	HCWs were observed for 15 different types of contact, ranked from clean to dirty (using the Fulkerson scale). Observers monitored HCWs during routine work on the units intermittently during the work shift of the observer. Data were stratified by unit (ICU or general ward) and profession.	Five infection control nurses, 21 nursing students, and 15 medical students participated as observers. They were trained in observing nurses and physicians and recording their HH behavior.	During the study, 2,138 observations were made, with nearly two-thirds of the observations made on regular shifts. In addition: • HCWs on regular wards performed HH more frequently than did those in ICUs (72.4% vs. 51.8%). • Nurses performed HH more often than physicians (67.9% vs. 57.5%).

Appendix 3-4. (continued)

Researcher(s)	Study Setting/Design	Observation Periods	Observation Methodology	Observers	Comments
Earl M.L., Jackson M.M., Rickman L.S.: Improved rates of compliance with hand antisepsis guidelines: a three-phase observational study. Am J Nurs 101:26–33, Mar. 2001.	Three-phase observational study in two ICUs at a university medical center in California over a five-month period: • 20-bed surgical ICU • 13-bed medical ICU	Phase 1: determined baseline with soap-and-water hand washing. Phase 2: two to six weeks following the installation of 73 ABHR dispensers both inside and outside patient rooms, HH was observed. Phase 3: observation period conducted 10-14 weeks post-installation: • Observation sessions were scheduled at varied times throughout the day and night in all three phases. • Observation sessions lasted either four or eight hours, with two observers assigned to each session. They observed one ICU during the first half of the session and then moved to the other unit in the second half.	• Observers recorded indications for HH during patient care episodes and noted whether HH actually occurred. • For each episode of care there were at least two instances for HH adherence: before and after patient contact. • HCWs were classified as ancillary staff, nursing staff, or physicians. • While the observations were done overtly, if approached by staff, the observers simply said they were doing an infection control study.	• Five observers, all public health graduate students, conducted observations at varied times during day and night shifts. • Each was trained in the study's criteria and methods. • Interobserver reliability of 65 observations was tested, using a third observer who worked simultaneously with one of the two observers assigned to a specific session and unit.	In a total of 402 hours of observation across the three phases, 3,015 opportunities for HH were recorded and in 1,481 HH was performed.
Pittet D., et al.: Effectiveness of a hospital-wide programme to improve compliance with hand hygiene. Lancet 356:1307–1312, Oct. 14, 2000. Errata in Lancet 356:2196, Dec. 23–30, 2000.	Observational study in a large teaching hospital in Switzer-land (following the baseline survey in 1994, described in Pittet 1999). Seven surveys were done twice a year in June and December, from 1994 to 1997.	Twenty-minute observations were done at prespecified times throughout the day and night.	HCWs were not aware of the observation schedule. Observers were as unobtrusive as possible. HCWs observed nurses, physicians, nursing assistants, and others.	• Infection control nurses performed the observation. • Recorded potential opportunities for and actual performance of HH. • Interrater reliability was	2,509 of the total 2,629 observation periods resulted in data being collection, with a total of almost 834 hours of observation. Data were collected on 20,082 opportunities for HH. Overall adherence improved from 47.6% in 1994 to 66.2% in

Appendix 3-4. (continued)

Researcher(s)	Study Setting/Design	Observation Periods	Observation Methodology	Observers	Comments
				recorded during at least 10% of the observation periods in which two or three observers worked simultaneously; • Interrater reliability was high (kappa values = 0.92; range 0.79–1.0)	December 1997 ($p < 0.001$). HH improved significantly among nurses and nursing assistants but remained poor among physicians.
Pittet D., et al.: Compliance with handwashing in a teaching hospital. Ann Intern Med 130:126–130, 1999.	Observational study in a sample of 48 different wards (medical, surgical, obstetrics/gynecology, pediatric ward, and ICU) in a large teaching hospital in Switzerland during a two-week period in December 1994.	Twenty-minute observation periods distributed randomly during the day and night over 14 days.	In most areas, HCWs providing care in a randomly selected room were observed; in the ICU, HCWs providing care to two patients in randomly selected beds were observed. HCWs observed included nurses, physicians, nursing assistants, and others. Data were recorded on a form that had been pretested and adjusted in a pilot study.	• Five trained infection control nurses. • Recorded potential opportunities for and actual performance of HH. • Interrater reliability was evaluated during 110 monitoring sessions (48 before and 62 during the study) in which two or three observers worked simultaneously. • Interrater reliability was high (kappa values = 0.92, range 0.81–1.0)	In 307 sessions totaling 105 hours of observation, observers recorded 2,834 opportunities for HH; average adherence was 48%. HCWs were most likely to wash hands after patient care.
Larson E.L., et al.: A multifaceted approach to changing hand washing behavior. Am J Infect Control 25:3–10, Feb. 1997.	Quasi-experimental study in two intensive care units (ICUs) in a 350-bed tertiary care academic health center in Washington, DC, over a 14-month period: • 7-bed neurological ICU (experimental	HH behavior in the two ICUs was observed in each of five study phases: • Baseline observation period; • Sinks converted from random to manual mode; • Sinks converted to automatic mode;	• Observers recorded whether nursing personnel washed hands when indicated, before or after patient contacts or critical procedures. • Hand washing frequency of nursing personnel was observed at	• Five observers (two investigators, three nursing students) • Trained in the use and interpretation of hand washing indications and use of the data collection form. • Interrater reliability testing	Observers completed 301 hours of observation (269.5 hours on day shift, 31.5 hours on night shift) in 365 observation periods. 2,624 hand washings were observed.

Appendix 3-4. (continued)

Researcher(s)	Study Setting/Design	Observation Periods	Observation Methodology	Observers	Comments
	unit) • 7-bed surgical ICU (control unit) Objective was to assess the effect of a multifaceted intervention (focus group sessions, installation of automated sinks, feedback to staff on HH behaviors) on influencing HH behaviors.	• Sinks converted to fully sequenced mode; and • Two-month post-intervention period. Observations were done on day and night shifts.	randomly selected sinks on both the experimental and control units: • Baseline; • Phases 2 through 4: One week after incremental automation; and • Post-intervention.	consisted of a minimum of 10 hand washings with 100% agreement on the indications for hand washing.	
Meengs M.R., et al.: Hand washing frequency in an emergency department. Ann Emerg Med 23:1307–1312, Jun. 1994.	Emergency department of a large tertiary care private teaching hospital in Indiana over a four-week period.	Patient contacts and activities for each emergency department staff member (nurses, resident physicians, faculty), were recorded during three-hour observation periods.	Data were collected during day and evening shifts, both weekday and weekend. Observations were overt but under the guise of being a "time-motion" study, with the data collection sheet coded so as not to include any words suggesting HH was being observed. All subjects consented to participate but their identities were kept anonymous. Three variables (staff level of training, years of clinical experience, and type of contact with patient [clean, dirty, gloved]) were examined for adherence to HH practices.	Observer was a student in a summer research program; details of preparation/training for the role of observer in the study are not described.	A total of 132 HH episodes were observed in 35 emergency department staff and 409 total patient contacts, for an overall adherence rate of 32.3%. Differences were noted between staff: • Nurses performed HH more often than faculty or residents. • HH frequency did not seem to be related to years of clinical experience. • HH was done more often after dirty or gloved contacts than clean contacts.

Appendix 3-5.

Sampling Approaches

As described by Lloyd, there are two basic approaches to sampling: probability and non-probability.[1] Probability sampling requires that there be a fixed probability of selecting any single element (n_i) from a known population of size n and that the selection of items from the population is determined by a random mechanism. Probability sampling is required if you want to get a truly representative sample of a population.

Probability sampling techniques include simple random sampling, stratified random sampling, and stratified proportional random sampling:

- *Simple random sampling.* One way to assess staff adherence to hand hygiene guidelines is to obtain a simple random sample. You can do this by developing a master list of all staff within the population of interest (this could be a single unit or the entire organization). Then you select the staff members you will observe by using a random selection method, such as selecting every 10th person or using a random number table. If you decide to select your sample by using systematic intervals (for example, every 10th person), it is important that you pick your starting point randomly. It is easier to use this sampling approach in small units (such as an intensive care unit) than organizationwide. One variation of this approach to consider is randomly selecting units or locations to be observed, rather than people, from a master list.
- *Stratified random sampling.* Stratified random sampling involves grouping the population into relatively homogenous categories *before* the sample is drawn and then applying the random selection process within each level of stratification. For example, if you have a master list of all clinical staff providing care in the intensive care unit, you can separate staff on the list by discipline (physician, nurse, others) and then randomly select staff within each discipline.
- *Stratified proportional random sampling.* Stratified proportional random sampling requires that the proportion that each stratum represented in the population is replicated in the sample. For example, you would need to determine the proportion of staff providing care in the intensive care unit represented by each discipline and then select a stratified sample that would accurately represent the relative proportions of all nurses, physicians, and other staff involved in care in that intensive care unit.

You can use non-probability sampling techniques when you are not concerned about generalizing to a larger population.[1] This approach is often used when focusing on high-risk areas or on units where an intervention is targeted.[2] It involves selecting a sample that you believe is typical of the population of interest. Three common forms of non-probability sampling are convenience sampling, quota sampling, and judgment sampling:

- *Convenience sampling.* Convenience sampling is the most commonly used approach to selecting persons or areas to measure. It is often used when there are very limited resources for data collection. To select a convenience sample, you simply choose staff members or areas of the organization that are readily accessible and available; hence, they are "convenient" to study.
- *Quota sampling.* Quota sampling involves identifying, in advance, a matrix that describes how many instances of a certain characteristic you want to account for and then collecting data until you reach that number of observations for each characteristic. For example, you might decide that you want to have observations on at least 100 different staff members each month, and you want the distribution of staff members to be 50% nursing, 30% physician, and 20% other. In this scenario, you would observe 50 nurses, 30 physicians, and 20 staff members from other disciplines.
- *Judgment sampling.* When using a judgment sampling approach, the data collector determines who should be sampled based on the data collector's expert knowledge of the subject and what or who the collector believes is most important to measure. Judgment sampling is most useful when you want to isolate and study individuals or a population exhibiting specific characteristics, knowledge, or activity. You should consider this approach when you have reason to believe certain groups or areas have particularly problematic hand hygiene practices.

References

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2. Donabedian A.: Quality of care. *JAMA* 260(12):1743–1748, 1988.

Appendix 3-6.

Examples of Research Articles That Found Evidence of the Hawthorne Effect

Authors/Article	Description	Findings
Kohli E., et al.: The Effect of Recognized Observers on Measurement of Hand Hygiene Compliance in High and Low Performing Inpatient Units (abstract). Orlando, FL: Annual Meeting of the Society for Healthcare Epidemiology of America, 2008.	Researchers tested the impact of known and unknown observers on hand hygiene (HH) adherence rates in health care workers (HCWs) at a 382-bed academic medical center in Lebanon, New Hampshire. Observational data on HCW HH practices collected in 2006 by three infection preventionists (IPs) who were well known to staff, was compared to data collected in April and May 2007 by a student, who was not known to staff. The student conducted observations in three specifically selected units: one with historically high HH adherence (unit A, > 90%), one with poor adherence (unit B, average of 45%), and one with recently improved adherence (< 50% to 60%).	Unit A and C both had statistically significant higher HH adherence rates when the IPs conducted the observations ($p = 0.003$ and 0.01 respectively). Unit B also had a slightly higher HH adherence rate when observed by the IPs, but the rate was not significant ($p = 0.3$). The researchers concluded that the use of unrecognized observers may be important in verifying high performance but is probably unnecessary in documenting poor performance.
Gould D.J., et al.: Measuring hand washing performance in health service audits and research studies. J Hosp Infect 66:109–115, Jun. 2007.	In this review article, the authors report that half of the 42 observational studies considered the possible effect of direct observation on HCW adherence rates.	The most frequently used method to try to avoid the Hawthorne effect was to do observations covertly. The authors reported that some organizations are intentionally promoting the Hawthorne effect to increase adherence, thus artificially inflating adherence rates and thereby providing incomplete or misleading information regarding HCW adherence.
Whitby M., McLaws M.L.: Methodological difficulties in hand hygiene research. J Hosp Infect 67:194–195, Oct. 2007.	In this letter to the editor, the authors comment on the complexity of human behavior in investigating HH adherence in HCWs.	The authors believe the elective component of HH behavior will react to the Hawthorne effect, while the inherent component that has been ingrained since childhood will not be so affected.
Eckmanns T., et al.: Hand rub consumption and hand hygiene compliance are not indicators of pathogen transmission in intensive care units. J Hosp Infect 63:406–411, Aug. 2006.	The study was conducted in five intensive care units (ICUs) at two university hospitals. Two observation studies were performed as part of a more comprehensive study. One observation period was done without advance notice to staff, and one was done after prior notification. Each observational study consisted of 10 separate observation periods of 120 minutes each.	A total of 2,808 HH observations were made. During the unannounced observation period, overall adherence was 29%, compared to 45% in the period with prior notification.

Appendix 3-6. (continued)

Authors/Article	Description	Findings
Pittet D., et al.: Hand hygiene among physicians: Performance, beliefs, and perceptions. Ann Intern Med 141:1–8, Jul. 6, 2004.	Researchers studied 163 physicians' adherence to HH in hospital wards during routine patient care throughout a large teaching hospital. At the end of the observation period, the observer asked the physicians whether they realized they were being observed.	Adherence was higher (61%, n = 117) when physicians were aware that they were being observed than when they were not aware that they were being observed (44%, n = 46).
Bittner M.J., et al.: Limited impact of sustained simple feedback based on soap and paper towel consumption on the frequency of hand washing in an adult intensive care unit. Infect Control Hosp Epidemiol 23:120–126, Mar. 2002.	This prospective study included observations of staff hand washing in two ICUs in a Veterans Affairs Medical Center. Actual counted hand washing episodes (CHWEs) at each sink were recorded by observers for four-hour intervals in two ICUs during baseline and follow-up periods. Observers also weighed soap and towels at each sink at the beginning and end of each four-hour session. Using a regression model that used changes in the weight of the soap and towels, the observers calculated estimated hand washing episodes (EHWEs) that corresponded to the changes in soap and towel weight. Between the baseline and follow-up periods, no observers were present, but EHWEs were still calculated.	When the researchers compared EHWEs when observers were present with the EHWEs when observers were absent, higher EHWEs were noted when observers were present.
Pittet D., et al.: Effectiveness of a hospital-wide programme to improve compliance with hand hygiene. Lancet 356:1307–1312, Oct. 14, 2000. Errata in Lancet 356:2196, Dec. 23–30, 2000.	More than 20,000 observations of HH opportunities were documented by the researchers in a large acute care teaching hospital before and during implementation of a HH program.	While the campaign produced a sustained improvement in HH adherence, the authors recognized the possible roles of observation bias and Hawthorne effect in their study, even though their observations were as unobtrusive as possible.
Tibballs J.: Teaching hospital medical staff to handwash. Med J Aust 164:395–398, Apr. 1, 1996.	This was a prospective study of hand washing by 61 ICU medical staff and visiting medical staff before and after patient contact in a pediatric ICU in a tertiary hospital. Baseline observations were done unobtrusively, followed by five weeks of overt observation with advance written notice; next, overt observation with feedback was done for four weeks; seven weeks after that, more unobtrusive observations were done for five weeks.	Baseline HH rates of the 939 patient contacts observed before and after contact were 12.4% and 10.6%, respectively. During overt observation, these rates increased and leveled off at 32.7% and 33.3%. These rates increased further when feedback on performance was provided (68.3% before, 64.8% after), but rates during the last unobtrusive observation period fell back to 54.6% before and 54.9% after patient contact.

chapter 4

Measuring Product Use

Measuring product use involves calculating the volume, quantity, or frequency of using such products as alcohol-based hand rub (liquid, gel, or foam), liquid soap, and paper towels or gloves (that is, the number of boxes ordered or distributed)

Product measurement is considered an *indirect* approach to assessing adherence to hand hygiene guidelines and the frequency of hand hygiene performance.[1,2] As a result, researchers have found varying degrees of agreement when comparing hand hygiene adherence rates derived from product use calculations versus those derived through the observation method (see Appendix 4-1). As you read through this chapter, therefore, it is important to contemplate the use of multiple measurement methods as a way to address the strengths and limitations associated with each measurement approach.

Strengths and Limitations of the Product Measurement Method

Strengths of Measuring Product Use

Measuring product use has several advantages:

- It is less resource intensive, less expensive, and therefore more efficient than the observation method of hand hygiene measurement.
- It can be done either manually or electronically.
- It allows organizationwide trends to be tracked over time.
- It is unobtrusive and reduces sampling bias and the Hawthorne effect, which are both common with observation.[3,4]
- Product use can be measured across all shifts, 24 hours a day, 7 days a week.
- It usually requires minimal staff training.
- It can be done in many different health care settings.

Some studies have reported that product measurement is more sensitive to changes in hand hygiene behavior than is observation. Consider the following examples:

- During a performance improvement project to implement the Centers for Disease Control and Prevention's (CDC's) 2002 hand hygiene guideline in their organization, Aragon et al. described how they educated staff on the benefits of hand hygiene, stressing the effectiveness of the alcohol-based hand rubs over hand washing, and increased the availability of the product on the units.[5] Alcohol foam use, tracked by the infection control department, doubled despite only a modest improvement in hand hygiene practice, based on observation in the first six months of the project.
- An Australian study compared direct observation with product measurement to determine the relative accuracy of these methods, as part of a hand hygiene intervention.[3] The authors noted that consumption of alcohol-based hand rub increased significantly, while direct observations showed no improvement in hand hygiene performance. The authors concluded that direct observation captures only a fraction of the total hand hygiene episodes practiced and that observation is neither a representative nor accurate measure of

hand hygiene performance. Haas suggested that, in both of these studies, hand hygiene observations inaccurately reflect total hand hygiene behavior because the sample selected underrepresented the populations studied.[1]

Two other researchers found an association between hand hygiene interventions to improve adherence and increased use of product:

- Pittet et al. measured product use as part of a hand hygiene intervention.[6,7] They found a progressive improvement in hand hygiene during a hand hygiene campaign between 1994 and 1997, based on more than 20,000 observed hand hygiene opportunities. Ongoing measurement revealed a statistically significant increase in the use of alcohol-based hand rub per 1,000 patient days between 1993 and 2001.
- McGuckin and colleagues described how they assessed health care workers' adherence to hand hygiene guidelines during a patient empowerment intervention in a hospital in the United Kingdom.[8] Patients who agreed to participate in the intervention asked health care workers who were about to have contact with them "Did you wash your hands?". The authors assessed adherence by measuring the volume of soap and alcohol-based hand rub used per bed day both before and after the intervention, with a 50% increase in the amount of products used after the intervention.

Limitations of Measuring Product Use

Measuring product use has some limitations:

- The validity of this approach has not been well established.[2]
- Because product measurement is not tied directly to opportunities for hand hygiene, measuring product use does not reveal whether health care workers perform hand hygiene when indicated.[1]
- Product use does not provide any information about when and why hand hygiene does *not* occur. van de Mortel notes that product use does not show who is and who is not practicing hand hygiene, or how well they are practicing it.[3]
- Measuring product use can be inaccurate and produce misleading results. Inaccuracy in measurement is frequently caused by the following:
  - Wasting or spillage of product, discarding of containers before they are empty, or changes in volume dispensed.
  - Inability to separate product used by patients and families from product used by staff. The inability to distinguish who is using the product may results in the overestimation of health care worker adherence to hand hygiene guidelines.[1]
  - "Gaming" (deliberate or intentional inflation of measurements) of the process by using extra product.[9]
  - Ordering of more product than is needed or anticipated to be needed.[10] "Borrowing" of product between wards.[10]
  - Failure to adjust adherence rates for workload or patient case mix.[1,2]
  - Evaluation of product use based on product purchase during a specified time period. (The amount purchased may differ from the amount used due to shelf life.)
  - Failure to account for pocket bottles.

Components of the Measurement Method

There are two primary ways to measure product use. The first is to measure the amount of a product that is used, and the second is to measure the frequency with which the product is used.

Measuring the Amount of Product Used

You can weigh or otherwise measure products such as soap, alcohol-based hand rub, and paper towels. For example, you can weigh or measure the height of soap or alcohol-based hand rub remaining in the dispenser, or you can measure the height of a stack of paper towels from one period of time to another. An easier approach might be to count the number of soap or alcohol-based hand rub containers, the stacks of paper towels placed on a unit, or the number of empty containers removed from the unit. When you have settled upon a specific measurement methodology, data can be collected consistently across the organization. This approach allows you to calculate the amount of product used at the specific unit, department, or organizational

level. Information on product use can also be collected for the entire health care organization by looking at purchasing or inventory data. You can report data on the quantity of products ordered or supplied throughout the organization at regular intervals (e.g., quarterly, annually). Of course, one drawback to measuring product use though purchasing or inventory data is that the number of hand hygiene opportunities varies by unit or department (see Appendix 3-2 in Chapter 3 for more information).

Text Box 4-1 describes how one organization measured product use at the unit or departmental level. Text Box 4-2 describes how two organizations measured product use at the organizational level.

Measuring the Frequency of Product Use

An alternative to measuring the amount of hand hygiene product used is to use automated tools—including electronic counting devices and electronic monitoring systems—to measure how frequently it is used.

Electronic Counting Devices

Several researchers have had experience with electronic counting devices in soap or alcohol-based hand rub dispensers:

- Larson et al. compared direct observation with electronic counting devices in dispensers.[11] The authors concluded that using electronic counters may be a practical way of monitoring hand hygiene adherence at the unit level. Because counters can be expensive, the authors suggest using a few counters and extrapolating the results to dispensers without counters.

- In another study, Larson and colleagues assessed the impact of an intervention to change an organization's culture in relation to the frequency of hand hygiene performance by health care workers, as measured by counting devices inserted in soap dispensers on four critical care units.[12] Each time soap was dispensed, the device recorded one count. A data collector routinely

Text Box 4-1.

Measuring at the Unit or Department Level

Shriners Hospital for Children in Erie, Pennsylvania, developed a method for estimating hand hygiene adherence based on the amount of hand hygiene product used in its outpatient clinic. In late summer 2007, the hospital began to collect the following data to calculate hand hygiene adherence:

- Quantity of hand hygiene liquid (total milliliters) supplied to the clinic per month
- Quantity of hand hygiene liquid remaining in the dispensers at the end of the month (dispensers were marked at the level of remaining product at the end of the month)
- Number of patient visits per month
- Observations of all staff who entered each treatment room during patient visits to the clinic over a two-day period

The hospital subtracted the amount of product left in dispensers at the end of each month from the amount of product supplied to the clinic per month to calculate the total product volume used. From observations, the hospital established that the average patient had 15 staff entries during a visit.

Shriners used the amount of hand hygiene liquid (total milliliters) used per month divided by the average amount of product dispensed (in milliliters) for each hand hygiene episode to determine how many hand hygiene episodes took place; this was then compared to the number of patient visits per month and multiplied by 15 (the average number of staff entries that should have resulted in at least one hand hygiene episode) to determine the minimum number of hand hygiene episodes that should have taken place. To calculate the hand hygiene adherence rate, Shriners divided the actual hand hygiene episodes by the calculated expected hand hygiene episodes that were based on patient volume and observational process studies. The resulting adherence rate was trended over time and fed back to the clinic. Only a short time after the initiative was put into place, the hospital began to see an increase in hand hygiene activity by tracking product usage. A follow-up observational study was planned in order to determine whether hand hygiene practice had improved.

Text Box 4-2.

Measuring at the Organizational Level

As part of its efforts to increase hand hygiene among hospital employees, Brookhaven Memorial Hospital Medical Center in Patchogue, New York, placed alcohol-based hand rub dispensers in all patient care areas throughout the organization in October 2003. The hospital has also been keeping track of the total annual purchases of product for the organization as a whole, noting that the amount purchased doubled between 2001 and 2005.

Aragon et al. described how, as part of an improvement project while implementing evidence-based guidelines for hand hygiene, they increased the availability of alcohol-based hand rub products in their hospital.[5] The infection control department tracked the number of cans of alcohol-based hand rub the organization ordered and consumed per 1,000 patient days. Six months after the start of the improvement project, alcohol-based hand rub consumption doubled from the pre-project baseline, and it remained high 9 and 12 months post-implementation.

recorded readings from all counters and reset each one after the reading.

- Researchers at the Hospital of Saint Raphael in New Haven, Connecticut, placed electronic devices in alcohol-based hand rub dispensers on a general medical unit and an intensive care unit. The devices recorded each time a dispenser was accessed; data were periodically downloaded via a handheld data transfer unit and then transferred to a secure Web site for analysis. The researchers were able to determine the number of hand hygiene episodes per patient day for each unit, map the location of each device to see which dispensers had the highest and lowest usage, and determine average uses per hour per dispenser by time of day. They felt this method permitted evaluation of the impact of hand hygiene interventions and was useful for studying the effects of dispenser location on product usage patterns.[13]
- A recent study of the correlation between product measurement and observation used electronic counting devices in dispensers. Researchers at Yale-New Haven Hospital in New Haven, Connecticut, placed electronic counters in each hand sanitizer dispenser located in two general medical units and a medical intensive care unit. The counters recorded dispenser lever depressions and electronically registered dispensers' location and the date and time of every event. Observations of hand hygiene opportunities per hour were performed in each study unit to determine the optimal number of hand hygiene episodes per patient bed day.[14]
- The Veterans Affairs Medical Center in Omaha, Nebraska, used counting devices installed in soap and alcohol-based hand rub dispensers on individual units. The devices counted each episode in which the dispenser was pressed. Each week, all the counts were read and summed; then the previous week's sum was subtracted from the current week's sum. The result was the total number of times the soap and alcohol-based hand rub were dispensed in the units during the previous week. The organization then divided these episodes by the number of patient care days.[4]
- The Dana Farber Cancer institute in Boston uses a touch-free dispenser and a hand hygiene monitoring system that is not linked to the individual who uses the sink. This system has a faucet with a programmable water suspension/lather time. Daily and total wash counts are displayed on an LCD, which links to a network and generates activity reports indicating the number of correctly completed hand hygiene episodes recorded at that dispenser.

There are some drawbacks to using electronic devices to count or collect information about hand hygiene performance. Multiple hits at a dispenser per person per hand hygiene event may artificially inflate the statistics about product use. Larson et al. counteracted this possible effect by using an auto-delay circuit and an automatic shutoff if five dispensing cycles occurred within 15 seconds.[11] Other limitations of electronic counting devices include the following:

- They are susceptible to "gaming" by an individual who repeatedly manipulates the dispenser.
- They are expensive.
- Batteries and counters can occasionally fail.
- Time is needed to read the counters and record the data.
- The dispensers can be damaged, stolen, or subject to limited access.
- A decreased amount of product may be dispensed as a dispenser ages.

Electronic Monitoring Systems

Electronic monitoring systems are designed to track product amount or frequency of use relative to specific events. They sometimes emit sounds that serve as reminders for health care workers to perform hand hygiene. Some systems track and record hand hygiene actions by individual health care workers. These technologically advanced devices are relatively new and expensive to purchase, and they have not been proven to result in sustained improvement in hand hygiene.[11,15]

Examples of electronic systems include the following:

- A tracking system that can record use by individual health care workers has been developed. Dartmouth-Hitchcock Medical Center in Lebanon, New Hampshire, began testing the system in late 2007. The dispenser, which is worn at the waist or from a lanyard and can be operated with one hand, electronically records each time the dispenser is used. The data are downloaded into a computer and summarized into hand hygiene episodes for each hour worked, or into "average hourly episodes" (AHEs) for a shift, week, month, quarter, or year. AHEs can also be represented in terms of patient days. The system provides individual health care worker feedback reports that compare hand hygiene episode rates with position- and setting-based goals. The system also includes an optional audio reminder system that, when activated, produces a soft white-noise sound each time the hand rub is dispensed; if the dispenser is not used again for a given number of preset delay minutes, it will emit the reminder sound. The audio system is intended to be used for the first few days a health care worker is wearing the dispenser, as a reminder to help establish use of the dispenser.
- Researchers at a Canadian rehabilitation hospital have developed a system that uses infrared sensors over a patient's bed to detect whether health care workers have washed their hands or used alcohol-based hand rub. Health care workers wear a device that beeps if hand hygiene is not performed before or after patient care. The system also records the last time hand hygiene was performed via the alcohol-based hand rub dispenser that the health care worker wears and is electronically tied to the system. The system is expected to be available by 2010.[16]
- Venkatesh et al. studied the utility of using electronic alerts to enhance hand hygiene adherence.[17] They placed electronic monitoring devices in alcohol-based hand rub dispensers, which also had motion detectors, outside 12 patient room entrances on one unit; they defined a hand hygiene opportunity as an entry to or an exit from one of the 12 rooms. If hand hygiene did not occur on entry or exit, the device produced a flashing light and a series of three simultaneous beeps, along with a prerecorded voice prompt that said, "Please wash your hands." The system recorded each hand hygiene opportunity and each time a health care worker dispensed hand rub in conjunction with the opportunity. The authors concluded that the electronic devices not only effectively monitored hand hygiene adherence but also facilitated improved

adherence from a baseline of about 36% to about 70% after the electronic monitoring devices were in use.

- An automated system electronically calculates soap and alcohol-based hand rub use by detecting when a soap or sanitizer dispenser lever is pressed. Each such action is transmitted wirelessly to a nearby computer, which then automatically sums the amount of soap and alcohol-based hand rub used by room, unit, shift, and day. Dividing total soap and sanitizer use per day by the patient census yields hand hygiene events per patient per day. Swoboda and colleagues describe how they used this system's motion detectors at the threshold of each patient room to monitor everyone who entered and exited the room, along with electronic and computer systems to monitor the use of toilets, sinks, and alcohol-based hand rub dispensers.[18] By setting time parameters, the computer system attributed hand hygiene performance or the lack thereof with each entry and exit. The system also included optional prerecorded voice prompts that automatically played if a health care worker did not perform hand hygiene prior to exiting a room or within 10 seconds of leaving the room. However, because the system could not determine who entered a patient room and whether hand hygiene was indicated, the denominator was much larger than the numerator, resulting in a low adherence rate.

Estimating Adherence Rates with Product Use Data

As an indirect measure of hand hygiene adherence, product use measurements cannot be used to directly calculate adherence rates, but they can be used to estimate them. Such estimates are most useful when they can be viewed within the context of a broader measurement strategy (that is, the multiple methods approach).

Customizing Calculations to Specific Units

Because the number of opportunities for hand hygiene varies widely according to the setting and patient population, it is important to determine a realistic number of expected opportunities based on the unit you are studying.

Larson et al. suggest that monitoring hand hygiene product use can indicate of the number of hand hygiene episodes.[11] They propose the method for calculating a unit-specific hand hygiene adherence rate summarized in Table 4-1.

Tools and Systems for Aggregating and Comparing Information

The Veterans Administration National Center for Patient Safety makes spreadsheets available online (http://www.va.gov/ncps/SafetyTopics/HandHygiene/index.html) for calculating the rate of alcohol-based hand rub used per 100 patient days and per 1,000 patient days. After you identify which alcohol-based hand rub is being used in your facility, you can select the appropriate spreadsheet. (If your organization uses alcohol-based hand rub containers different in size from the choices on the spreadsheet, you can adapt the form by changing the grams in the "Grams per Can" column). To track the data, each month you enter in the spreadsheet the number of cans or containers used and the number of patient days of care provided in the area in which the cans or containers were used.

Text Box 4-3 describes two hospitals that use a system for product measurement that has benchmarking capabilities.

Table 4-1.

Method for Calculating a Unit-Specific Adherence Rate

Parameter	Method of Assessment	Example
Number of indications for hand hygiene	1. Directly observe personnel long enough to observe approximately 200 indications.	200 indications for hand hygiene were observed during a period of 5 hours
	2. Divide the total number of indications by the total time observed to obtain a mean number of indications for hand hygiene per hour.	200 / 5 = 40 indications per hour
	3. Multiply the value obtained in step 2 by 24 to get the mean number of indications per day.	40 x 24 = 960 indications per day
	4. Obtain the patient census for the period the observations were made.	Patient census for day of observation was 30
	5. Calculate mean number of indications for hand hygiene per day per patient by dividing mean number of indications per day by the census value.	960 / 30 = 32 indications for hand hygiene per day per patient
Number of actual episodes of hand hygiene	1. Obtain data on volume of hand hygiene products (soap and alcohol) used per month for the unit.[1]	12,000 mL of product used per month
	2. Divide the total volume used by the amount of product dispensed with each hit.[2]	12,000 mL / 1.5 mL per hit = 8,000 total hits/month
Hand hygiene adherence rate	1. Compute number of indications per month by multiplying indications for hand hygiene per day per patient by the number of days in the month by the mean monthly patient census.	32 indications x 30 days x 32 mean monthly census = 30,720 indications in that month
	2. Obtain a hand hygiene adherence rate by dividing the total number of hits by the total number of indications for that month.	8,000/30,720 = 26.0% adherence rate
Ongoing monitoring	1. Repeat baseline observations if evidence indicates that patterns of hand hygiene have changed or if a hand hygiene intervention is planned.	Not applicable

1. This step will require coordination with the purchasing department
2. The amount of product dispensed with each hit may vary according to the type of product or dispenser

Source: *Larson E.L., Albrecht S., O'Keefe M.: Hand hygiene behavior in a pediatric emergency department and a pediatric intensive care unit: Comparison of use of 2 dispenser systems.* Am J Crit Care *14:304–310 (table is located on p.308), Jul. 2005. Used with permission.*

Text Box 4-3.

Measuring Product Use with Comparative Reports from a Measurement System

Many facilities with hand hygiene adherence monitoring programs use a product measurement system that has benchmarking capabilities. The system provides health care workers and patients with educational tools and includes a data measurement component.

Two eastern U.S. hospitals have used the services of a measurement system for calculating and comparing adherence rates. This measurement system, developed in 2003, estimates hand hygiene episodes per bed day based on an average amount of product used (1.7 mL soap and alcohol-based hand rub per hand hygiene episode) by unit type. As with all the other participants in this system, Eastern Maine Medical Center in Bangor, Maine, and Caritas Norwood Hospital in Norwood, Massachusetts, submitted data each month and received monthly hand hygiene adherence reports that included benchmarking by unit type and hospital size. Housekeeping staff collected and counted empty soap and alcohol-based hand rub product containers; the monthly total of each, by unit, was forwarded to the individual or department that prepared the data submission forms that went to the measurement system. Initially, both organizations collected baseline product usage data for six weeks for specific units. (The measurement system also permits organizationwide aggregate data collection if unit-specific product usage cannot be determined.) When the baseline usage information was complete, the organizations implemented their intervention program, which included patient empowerment in asking health care workers if they had washed or sanitized their hands before providing care. Following implementation of the intervention, the organizations began the measurement and benchmarking portion of the program. The methodology used for the benchmarking is a linear regression model that uses prediction intervals calculated at the 10th and 90th percentiles. Graphs with monthly data points and a table are produced for each unit. More information about the methodology and sample graphs are available at http://www.hhreports.com.

Key Points, Chapter 4

- Measuring product use is an indirect approach to measuring hand hygiene adherence, the validity of which has not been well established.
- Because the number of opportunities for hand hygiene varies widely according to the setting and patient population, it is important to calculate adherence rates using realistic numbers of expected opportunities that are appropriate to the unit.
- Technological solutions ease data collection but do not necessarily overcome the limitations of measuring product.

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Appendix 4-1.

Studies Examining the Association between Product Measurement and Observation

Authors/Article	Description of Measurement Method	Description of Findings
Torres-Viera C., Dolan M., Dembry L.-M.: Correlation Between Direct Observation of Hand Hygiene Compliance and Electronically Monitored Use of Hand Sanitizer (abstract). Society for Healthcare Epidemiology of American annual scientific meeting, Orlando, FL, April, 2008.	Electronic counters were installed in alcohol-based hand rub (ABHR) dispensers in two general medical units and a medical intensive care unit (MICU). They recorded dispenser lever depressions and electronically recorded the dispenser location, date, and time of each event. Observations of hand hygiene (HH) opportunities per hour were conducted in each study unit to determine the optimal number of HH episodes per patient bed day during the two-month study period.	During the study period, mean events per month were 21,432 (MICU), 20,872 (Unit A), and 29,317 (Unit B), which corresponded to 43.8, 18.9, and 22.6 HH events per bed day, respectively. There was no statistically significant difference in events per bed day when each unit was evaluated in terms of night and weekend vs. day and weekday dispenser use. Observed HH adherence as measured by direct observation was 88%, 80%, and 70%, for MICU, Unit A, and Unit B, respectively. Calculated HH adherence by electronically determined events per bed day was 38%, 14%, and 15%, respectively. Rates of observed HH adherence were much higher than rates as measured by electronic surveillance and calculated based on the optimal average events per bed day.
Eckmanns T., et al.: Hand rub consumption and hand hygiene compliance are not indicators of pathogen transmission in intensive care units. J Hosp Infect 63:406–411, Aug. 2006.	The authors performed two HH observation studies (10 months apart); each observation period consisted of 10 separate observation periods (120 minutes each), to capture staff HH activities. Data were compared from 2,808 observations of HH opportunities across five intensive care units (ICUs) in the university hospitals with ABHR consumption data obtained from the pharmacy. ABHR consumption was calculated per 1,000 patient days. In addition, the authors genotyped all	Correlation between ABHR consumption and HH adherence was 0.87 ($p = 0.05$). More than 30,000 specimens were received by the microbiology laboratory, and 141 transmission events were identified. Forty-one (29%) of the transmissions were related to health care–associated infections. The incidence of health care–associated infections was found to be a relatively good indicator for the identification of pathogen transmission, but there was no correlation between the

Appendix 4-1. (continued)

Authors/Article	Description of Measurement Method	Description of Findings
	isolates of the most frequent pathogens from patients hospitalized in two organizations' ICUs for > 48 hours to identify transmission episodes. The incidence of transmission was correlated with HH adherence and health care–associated infection rates.	incidence of transmission episodes and hand rub consumption or HH adherence.
Sohn-Tuma S., et al.: Hand hygiene product consumption rates: What does it tell us about compliance? (abstract). Society for Healthcare Epidemiology of America annual scientific meeting, Chicago, March, 2006.	Trained observers monitored health care worker traffic and HH practices over a 17-month period on six inpatient floors at a 425-bed tertiary care hospital. Purchased quantities of soap and ABHR were obtained from the hospital's General Services Department.	Overall observed HH adherence in 7,936 opportunities was 23.7%; during the same period, the estimated adherence using consumption of products was 74.4% assuming 1 dispensing per HH episode or 37.2% assuming 2 dispensings per HH episode. The authors concluded that volume-based indicators alone may not accurately reflect HH adherence and presents difficulties in interpretation.
Bittner M.J., Rich E.C., Arnold W.H.: Limited impact of sustained simple feedback based on soap and paper towel consumption on the frequency of hand washing in an adult intensive care unit. Infect Control Hosp Epidemiol 23:120–126, Mar. 2002.	The researchers used a regression model using soap and towel weight changes during observation sessions of actual hand washing episodes to calculate estimated hand wash episodes (EHWEs) in the MICU and surgical intensive care unit (SICU) of a medical center. They then calculated each unit's average daily EHWEs per occupied bed.	A strong relationship was found to exist between actual counted hand washing episodes and the consumption of soap and towels, with all correlations significant ($p < .001$).
Bittner M.J., Rich E.C.: Surveillance of handwashing episodes in adult intensive-care units by measuring an index of soap and paper towel consumption. Clinical Performance and Quality Health Care 6:179–182, Oct.–Dec. 1998.	Live observations, in four-hour intervals, of staff HH episodes were done in a MICU and SICU at a medical center during a six-month period (divided into baseline and four follow-up periods). The observer also measured paper towel height, towel weight, and soap weight at each sink on all non-holiday weekdays during the same period of time. Nurse staffing and the number of occupied beds for each unit were also recorded.	A total of 759 HH episodes were observed during the study period. Data from baseline and the four follow-up periods were tested to determine the relationship between the counted HH episodes and the consumption of soap and towels. For both units, stepwise regression retained changes in the weight of soap and towels as independent variables ($p < .0001$), with $R2 = 0.965$ (MICU) and 0.981 (SICU).

chapter 5

Conducting Surveys

"The principal objectives [of a survey] should always be to collect reliable, valid, and unbiased data from a representative sample, in a timely manner and within resource constraints."[1(pg. 2)]

Surveying health care workers, patients, and family members is an indirect method of assessing aspects of hand hygiene adherence. You can use surveys to gather information on health care worker perceptions, attitudes, and practices related to hand hygiene, as well as patients' and families' attitudes and perceptions related to the hand hygiene practices of health care workers. Surveys can be administered over the telephone, electronically (over a computer network or via the Internet), on paper (on-site or via mail) or through in-person interviews and focus groups. In-person interviews allow you to not only ask the planned questions but to probe more deeply into an individual's responses. Conducting focus groups, which are essentially guided conversations, can help you elicit information underlying complex behavior and motivation and can yield descriptions and insights that are difficult to capture in individual interviews or other types of surveys.[2]

How you administer a survey depends on considerations such as the number of people you plan to reach, where they are located, and the complexity of the sample (for example, all health care workers in a particular region of the country vs. physicians in one hospital's intensive care unit). Each method has advantages and disadvantages, as the mode of survey administration has been shown to affect how individuals respond to identical survey questions.[3] For a more in-depth discussion of survey administration, see Burroughs et al.,[4] Kellerman et al.,[5] and Rodriguez et al.[6]

Strengths and Limitations of Using Surveys

Strengths of Using Surveys

Surveys can measure a range of hand hygiene components that observation and product measurement alone cannot measure, including the following:

- Staff knowledge, attitudes, and beliefs
- Health care workers' perceptions of their own behavior
- Patient and family satisfaction with staff hand hygiene
- Health care workers' satisfaction with hand hygiene products
- Structural issues, such as the availability of hand hygiene products, product accessibility, and the like

Not only are surveys useful for learning *what* health care workers know and think, surveys are useful for uncovering *why* health care workers adhere (or do not adhere) to hand hygiene guidelines. For example, if you discover that health care workers are not adhering to guidelines, a survey can help you determine the following:

- Whether health care workers are unaware of existing guidelines
- Whether health care workers are unfamiliar with their organization's hand hygiene policies
- Whether health care workers have considered all of a guideline's details

- Whether health care workers have a negative attitude toward adhering to guidelines, and if so, why

Surveys can be used to address a range of components and be combined with other methods of measuring hand hygiene. For example, one study combined the use of questionnaires and focus groups in order to assess the effectiveness of a poster campaign to improve the rates of hand hygiene performance.[7] A well-designed and carefully administered survey can be used to guide the development of your organization's educational programs and initiatives or to evaluate the effectiveness of your educational efforts when they are complete.

Limitations of Using Surveys

Surveys have some limitations, which may vary based on the type of survey being administered. They include the following:

- Surveys to determine hand hygiene adherence can yield results that are inaccurate, unreliable, or lacking in validity, as health care workers tend to overestimate their adherence to hand hygiene guidelines on surveys.[8]
- The validity of the survey depends on how well the survey was developed and administered. Inadequate validity testing is common.[8,9] Before using an existing tool, you should determine whether its validity (does it adequately reflect the meaning of the concept under study?) and reliability (do the questions mean the same thing to every respondent?) have been established.
- Surveys that ask respondents to remember something from the past can introduce recall bias. Recall bias can occur because memories are imperfect and vary based on individual perception. This makes eliciting accurate and reliable responses about a past incident or process difficult.

Before you administer a survey to gather hand hygiene information, it is important to keep several additional considerations in mind:

- Consider survey bias:
  - Will the results accurately represent the population?
  - Will everyone in the survey population have an equal opportunity to respond?
  - What is your desired response rate?
  - How much follow-up is needed to obtain that response rate?
  - What might the differences be between survey responders and nonresponders?
- How readable and understandable are the survey questions, particularly to non-health care workers?
- How will you manage language or other communication-related challenges?
- How much time has elapsed between fielding the survey and the event(s) about which your survey asks?

As is the case with observation and product measurement, the accuracy of your results also depends on how well the survey is implemented. A low response rate or a biased sample can make your survey results less useful because the information cannot be generalized to the population you are interested in studying. A detailed discussion of general methodological considerations for surveys is beyond the scope of this monograph. Edgman-Levitan[10] and Krueger[11] are good texts to consult for more in-depth discussion of these issues.

Finally, it is important to share results with those who contributed through the survey. Follow-up actions based on staff recommendations demonstrates that their input is valued.

Components of Hand Hygiene that Surveys Can Assess

The following sections address the different components of hand hygiene that surveys can help you assess:

- Staff knowledge
- Staff attitudes and beliefs
- Staff perceptions of their own, or their colleagues', behavior
- Structural factors that can facilitate or inhibit staff hand hygiene performance

- Patient and family satisfaction with staff performance
- Staff satisfaction with products
- Assessment of staff skin condition

Appendix 5-1 provides examples of surveys that have been used to address each of these components, along with the source or developer of the survey and its title.

Staff Knowledge

The Institute for Healthcare Improvement (IHI) recommends periodically surveying staff to assess their knowledge about key elements of hand hygiene as part of a multidimensional hand hygiene program.[12] If survey results indicate that staff education about guidelines is needed, surveys can help you assess the effectiveness of your educational efforts by tracking changes in staff knowledge over time. Appendix 5-1 lists examples of tools your organization can use to assess staff knowledge about hand hygiene guidelines and indications.

Staff Attitudes and Beliefs

Staff attitudes and beliefs directly affect hand hygiene behavior.[13] For example, Pittet et al. conducted a survey to determine why physician adherence to hand hygiene guidelines did not substantially improve after a promotional campaign, when all other health care workers' adherence did.[14] Physicians were given a self-report survey that asked questions about their attitudes, beliefs, and perceptions regarding hand hygiene. The researchers found that attitudes and beliefs may explain differences in adherence to hand hygiene guidelines between physicians and other health care workers in the same hospital.[14]

In another study, Sax et al. conducted a self-report survey to quantify the different behavioral components of health care workers' motivation to perform hand hygiene.[15] The survey revealed that adherence to hand hygiene guidelines is driven by peer pressure and the perception of high self-efficacy rather than by awareness of the impact of hand hygiene on patient safety. Women, health care workers who received training in hand hygiene, and those who had been exposed to a hand hygiene campaign were more likely than others to adhere to hand hygiene guidelines. Appendix 5-1 lists several survey instruments that assess health care workers' attitudes and beliefs related to hand hygiene.

Staff Self-Perceptions of Hand Hygiene Behavior

How accurate are self-reported surveys of hand hygiene behavior? One study compared the results of direct observation for measuring nurses' hand hygiene performance with the performance they recorded in their diaries for 22 months.[16] The study measured the following aspects of hand hygiene behavior:

- The number of times per hour nurses washed their hands
- The number of times per hour nurses applied alcohol hand rub
- The number of times per hour nurses applied hand lotion
- The number of times per hour nurses donned and removed gloves
- The number of minutes and hours nurses spent wearing gloves

The two measurement methods yielded different results, but the researchers were unable to determine which measurement method was more accurate or less biased, given the many variables that can affect the results of direct observation (discussed in detail in Chapter 3).

In another study, researchers compared hand hygiene practices of health care workers resulting from both direct observation and their answers to a questionnaire.[17] Physicians reported greater adherence to hand hygiene indications than observers noted, especially before an invasive procedure. A 1996 study by Tibballs et al. also found that physicians tended to overestimate their hand hygiene performance.[18] Nurses reported lower adherence to hand hygiene indications than observers noted for all technical procedures. The reverse was true for hand washing before invasive procedures, but the differences between self-reported behavior and observed behavior were not statistically significant. The results of this study indicate an

overall consistency between self-reported and observed hand hygiene behavior practices for nurses.

On the other hand, O'Boyle et al. compared nurses' adherence to hand hygiene guidelines based on observation and self-reported adherence in four hospitals.[19] They found that, on average, the nurses reported greater adherence to the guidelines than observers noted. Based on their findings, these researchers concluded that the self-report method for measuring hand hygiene performance is inadequate and should not be used.

Other researchers have highlighted the limitations of using health care workers' self-report surveys to measure hand hygiene performance.[9] Although self-report surveys are inexpensive to administer and may prompt health care workers to think about their hand hygiene behavior, studies such as those cited here indicate that their validity for measuring hand hygiene adherence is weak.

Examples of tools that assess self-reported hand hygiene behavior are listed in Appendix 5-1.

Structural Factors and Considerations

Structural factors and considerations refer to the physical availability and accessibility of hand hygiene products. Some examples of these factors and considerations are whether soap and alcohol-based hand rub are readily available, whether dispensers and sinks are in good working order, and policies and procedures for their use are in place where the staff can read them. It is important to survey staff periodically to help identify basic supply and equipment-related problems. Checklists for making observations of these structural aspects are ideal for this purpose. Appendix 5-1 includes examples of tools that can help your organization assess any structural barriers to hand hygiene performance.

Patient or Family Satisfaction with Staff Performance

Surveying patients and family members can help health care workers determine whether patient perceptions match their own view of their hand hygiene performance.[8]

There are a number of ways to survey patients and families. One way is to incorporate questions about health care workers' hand hygiene performance into your organization's patient satisfaction survey. However, surveying patients and families presents challenges, including variation in patients' and family members' language and literacy skills, impaired cognitive ability of respondents that may go unrealized, impaired vision, varying obstructions in patients' line of vision, and differences in levels of knowledge about what constitutes good hand hygiene practice.

Four hospitals that submitted material for the Consensus Measurement in Hand Hygiene project addressed patient satisfaction with their health care workers' hand hygiene performance in their hospital satisfaction questionnaire and are described in Text Box 5-1.

Staff Satisfaction with Products

Health care workers who believe their organization's soap and/or alcohol rub are irritating, drying, or smell bad are less likely to use them. Therefore, surveying staff satisfaction with products can help you understand reasons for poor hand hygiene. Organizations such as the World Health Organization have developed product satisfaction surveys. (See Appendix 5-1 for more information on these surveys.)

Assessment of Skin Condition

Frequent hand hygiene during patient care can result in skin irritation, so selection of acceptable and effective hand hygiene products is important in promoting hand hygiene adherence.[8,20] Self-assessment surveys on staff hand skin condition can be useful in gauging the impact of hand hygiene products on dermal tolerance. Appendix 5-1 contains examples of self-assessment survey related to skin condition.

Text Box 5-1.

Examples of Patient Satisfaction Surveys

Eastern Maine Medical Center in Bangor, Maine, has used student volunteers during the summer months to help obtain patient feedback on hand hygiene using a short questionnaire. The questions the students asked include the following:

- Has anybody talked to you about hand hygiene? (yes or no)
- Do you know where the alcohol hand gel is? (yes or no)
- Are you seeing the staff clean their hands with soap and water or gel before caring for you? (yes, no, or sometimes)
- Do you feel comfortable asking your health care providers if they have washed their hands? (yes or no)
- Would you like your own alcohol hand gel? (yes or no). (Patients who answer "yes" are given a small bottle of alcohol-based hand rub.)

Brookhaven Memorial Hospital Medical Center in Patchogue, New York, has added a general question on its patient satisfaction survey that asks patients to rank their level of satisfaction, using a five-point Likert scale, with "the adequacy of precautions taken to protect your safety (washing hands, wearing gloves, etc)." In the last two quarters of 2007, the organization saw a statistically significant increase in the positive rating of this survey item.

Greenville Hospital System in Greenville, South Carolina, uses a patient satisfaction survey for patients seen in their emergency department and outpatient surgery area. The survey asks patients to rank their level of satisfaction (using a five-point Likert scale) on "the extent to which staff cleansed their hands with either hand gel or soap and water before providing care."

Spartanburg Regional Healthcare System in Spartanburg, South Carolina, uses its patient satisfaction survey to ask "Did your health care worker perform hand hygiene before contact with you?" Spartanburg, which has been asking this question on its survey for over three years, initially found that the feedback from the patients via the survey was different (worse) than their observational data on staff hand hygiene adherence suggested. Spartanburg suspected that patients might not always see staff performing hand hygiene, so it began teaching staff to tell patients why and what they were doing when washing or using the alcohol-based hand rub. The hospital has since had positive patient feedback results on this question, in the 80% to 90% range.

Key Points, Chapter 5

- Surveys are useful for measuring components such as perceptions, attitudes, and satisfaction.
- Strengths and limitations of surveys vary based on the purpose and type of survey administered.
- Some surveys, such as those listed in Appendix 5-1, are designed to measure multiple components. You may not need to use a separate survey for each component you want to measure.
- Before implementing a survey, determine whether its reliability and validity have been established.
- Tailor the survey you use and the way you will administer it to the population you want to survey and what you need to know.
- The accuracy of the results of a survey is highly dependent on the reliability and validity of the tool and the quality of the implementation process.

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Appendix 5-1.

Examples of Hand Hygiene Surveys and Checklists

Developer/Source	Survey/Checklist Title	Components						
		Staff Knowledge/Competency	Attitudes and Beliefs About Hand Hygiene	Self-Report of Hand Hygiene Behavior	Structural Factors (e.g., product availability, equipment functionality, written policies in place)	Patient/Family Satisfaction with Staff Performance	Staff Satisfaction with Products or Product Availability	Assessment of Skin Condition
E. Larson: A tool to assess barriers to adherence to hand hygiene guidelines. Available in: Am J Infect Control 32:48–51, 2004.	Attitudes Regarding Practice Guidelines		X					
E. Larson, et al.: Skin reactions related to hand hygiene and selection of hand hygiene products. Available in: Am J Infect Control 34:627–635, 2006. Address correspondence to Didier Pittet, M.D., MS, Director, Infection Control Program, University of Geneva Hospitals, 24 Rue Micheli-du-Crest, 1211 Geneva, Switzerland; didier.pittet@hcuge.ch.	Hand Skin Self-assessment Tool							X
E. Larson: Tools developed for research project.	Hand Hygiene Guideline Implementation Survey: Part I, Interview with Director of Infection Control			X	X			
	Hand Hygiene Guideline Implementation Survey: Part II, Clinical Rounds and Observation				X			
Final Report of the New South Wales Hand Hygiene Campaign Address correspondence to Clinical Excellence Commission, GPO Box 1614, Sydney NSW 2001, Australia; (612) 9382-7600; http://www.cec.health.nsw.gov.au/moreinfo/cleanhands_report.html; cpip@cec.health.nsw.gov.au.	"Clean Hands Save Lives" Campaign Post Campaign Staff Survey (Appendix 15))		X	X				
	Clean Hands Save Lives Campaign Patient/Visitor Survey (Appendix 16)					X		
	Clean Hands Save Lives Campaign Hand Hygiene Questionnaire (Appendix 18)				X			
Infection Control Nurses Association (ICNA), United Kingdom. In Audit Tools for Monitoring Infection Control Guidelines within Acute Settings, 2004. Available at http://www.ips.uk.net/icna/Admin/uploads/audit_tools_acute.pdf. Address correspondence to info@fitwise.co.uk.	Infection Control Audit Tools, Hand Hygiene (Acute Setting), (includes observation of competency)	X			X			

Appendix 5-1. (continued)

Developer/Source	Survey/Checklist Title	Components						
		Staff Knowledge/Competency	Attitudes and Beliefs About Hand Hygiene	Self-Report of Hand Hygiene Behavior	Structural Factors (e.g., product availability, equipment functionality, written policies in place)	Patient/Family Satisfaction with Staff Performance	Staff Satisfaction with Products or Product Availability	Assessment of Skin Condition
Infection Control Nurses Association (ICNA), United Kingdom. In Audit Tools for Monitoring Infection Control Guidelines within the Community Setting, 2005. Available at http://www.ips.uk.net/icna/Admin/uploads/AuditTools2005.pdf. Address correspondence to info@fitwise.co.uk.	Infection Control Audit Tools, Hand Hygiene (Community Setting)				X			
Institute for Healthcare Improvement. In How-to Guide: Improving Hand Hygiene, A Guide for Improving Practices Among Health Care Workers. Cambridge, MA: Institute for Healthcare Improvement, 2006. Available at http://www.ihi.org.	Appendix 1. Hand Hygiene Knowledge Assessment Questionnaire,	X						
	Appendix 2. Checklist for the Availability of Alcohol-based Hand Rub and Clean Gloves				X			
Michigan Health and Hospital Association, MHA Keystone Center for Patient Safety & Quality, HAI Collaborative. Available at http://www.mhakeystonecenter.org.	Health Care Worker Perceptions & Beliefs Regarding Hand Hygiene		X	X	X			
	Hand Hygiene Policy/Procedure Checklist				X			
	Hand Hygiene Structural Assessment				X			
Ministry of Health and Long Term Care, Ontario, Canada. In Detailed Third Party Evaluation Report. Available at http://www.justcleanyourhands.ca/program_overview.php (tools 1–3), http://www.justcleanyourhands.ca/environmental_changes.php (tools 4–5), and http://www.justcleanyourhands.ca/observation_tool.php (tools 6–12). All tools are available and can be downloaded free from the website. For more information, contact Ministry of Health and Long-Term Care, Suite 810 1075 Bay Street, Toronto ON M5S 2B1 Canada, 416-326-6362.	(1) Appendix G: Healthcare Worker Questionnaire (used in the 10 Ontario pilot sites)		X	X				
	(2) Appendix H: Healthcare Worker Focus Group Guide (used in the 10 Ontario pilot sites		X	X				
	(3) Appendix I: Patient Discharge Questionnaire (used in the 10 Ontario pilot sites)					X		
	(4) Assessment Tool for Health Care Provider Hands							X

Appendix 5-1. (continued)

Developer/Source	Survey/Checklist Title	Components						
		Staff Knowledge/Competency	Attitudes and Beliefs About Hand Hygiene	Self-Report of Hand Hygiene Behavior	Structural Factors (e.g., product availability, equipment functionality, written policies in place)	Patient/Family Satisfaction with Staff Performance	Staff Satisfaction with Products or Product Availability	Assessment of Skin Condition
	(5) Placement Tool for Hand Hygiene Products				X			
	(6) Baseline Hand Hygiene Perception Survey (staff)		X					
	(7) Follow-up Hand Hygiene Perception Survey (staff)		X					
	(8) Hand Hygiene Perception Survey (senior and middle management)		X					
	(9) Hand Hygiene Knowledge Test (staff)	X						
	(10) Baseline Hand Hygiene Unit Structures Survey (managers)				X			
	(11) Follow-up Hand Hygiene Structures Survey (managers)				X			
	(12) Facility-level Situation Assessment		X		X			
Ministry of Health and Long Term Care, Ontario, Canada, http://justcleanyourhands.ca/implementation_strategy_6.php.	On-the-spot form for immediate confidential feedback			X				
U.S. Department of Veterans Affairs. Available at http://www.va.gov/ncps/SafetyTopics/HandHygiene/HHQuestionnaire.doc.	Hand Hygiene Questionnaire Developed for VA-3M Six Sigma Project (2006).		X	X	X		X	X
World Health Organization, World Alliance for Patient Safety, Geneva Switzerland. From Manual for Observers, WHO Multimodal Hand Hygiene Improvement Strategy, 2006.	Evaluation of Tolerability and Acceptability of Alcohol-based Handrub Use—Method 1		X	X			X	X

Appendix 5-1. (continued)

Developer/Source	Survey/Checklist Title	Components						
		Staff Knowledge/Competency	Attitudes and Beliefs About Hand Hygiene	Self-Report of Hand Hygiene Behavior	Structural Factors (e.g., product availability, equipment functionality, written policies in place)	Patient/Family Satisfaction with Staff Performance	Staff Satisfaction with Products or Product Availability	Assessment of Skin Condition
World Health Organization, World Alliance for Patient Safety, Geneva Switzerland. From http://who.int/gpsc/en/.	Questionnaire on Ward Structures for Hand Hygiene				X includes an inventory			
	Questionnaire on the Perception of Hand Hygiene and Health Care-associated Infections for Senior Executive Managers		X	X				
	Hand Hygiene Knowledge Test for Health-care Workers	X						
	Baseline Questionnaire on the Perception of Hand Hygiene and Health Care-associated Infections for Health-care Workers		X	X				
	Follow-up Questionnaire on the Perception of Hand Hygiene and Health Care-associated Infections for Health-care Workers		X	X				
	WHO Hand Hygiene Structure Quality Audit Tool	X			X			

chapter 6

Assessing the Thoroughness of Hand Hygiene and Related Aspects

It is as important to assess the thoroughness, or technique, with which health care workers perform hand hygiene as it is to monitor performance itself. Gould and colleagues point out that, "Although alcohol products were specifically intended to increase the frequency of hand hygiene at busy times, decontamination may become cursory with increasing workload, further reducing adequate surface contact."[1(p. 98)] Paradoxically, they also caution that if health care workers assume that use of alcohol-based hand rub is consistent with best practice, "tokenistic use at busy times may contribute to increase in cross-infection as more areas of the hands escape contact." [1(p. 98)] The time health care workers take to perform hand hygiene is not necessarily an indication of its thoroughness. In a study Taylor undertook to evaluate the hand hygiene techniques of health care workers, she observed that some nurses cover all areas of their hands with alcohol-based hand rub in 20 seconds, whereas others fail to do so in 2 minutes.[2]

The CDC hand hygiene guideline makes the following recommendations for performing hand hygiene[3]:

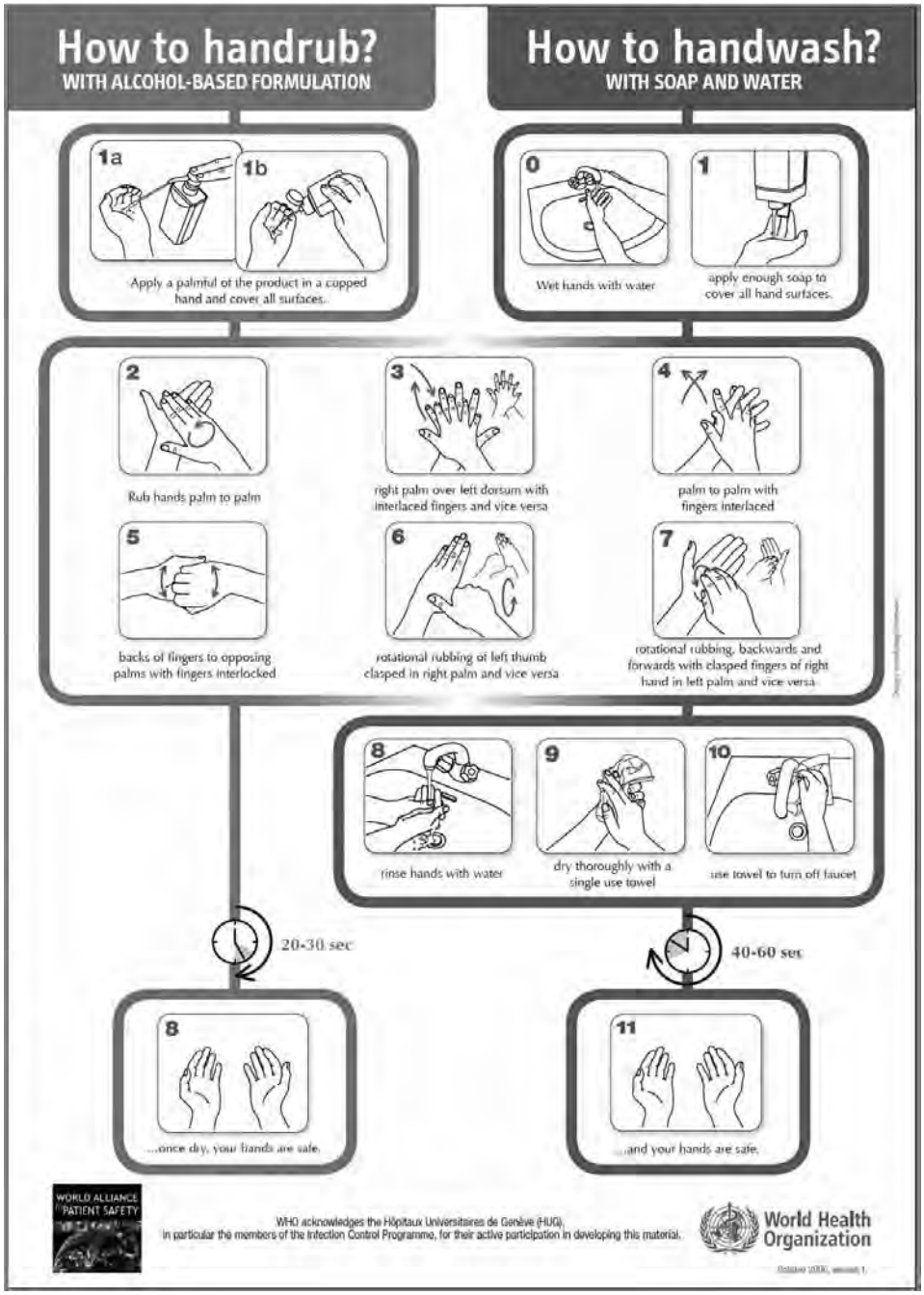
- When decontaminating hands with an alcohol-based hand rub, apply product to the palm of one hand and rub hands together, covering all surfaces of hands and fingers, until hands are dry. Follow manufacturer's recommendations regarding the volume of product to use.
- When washing hands with soap and water, wet hands first with water, apply an amount of product recommended by the manufacturer to hands, and rub hands together vigorously for at least 15 seconds, covering all surfaces of the hands and fingers. Rinse hands with water and dry thoroughly with a disposable towel. Use towel to turn off the faucet.
- The World Health Organization's (WHO's) *Guidelines on Hand Hygiene in Health Care* states that understanding hand hygiene practices among health care workers is essential when planning hand hygiene improvement interventions; while the frequency of hand hygiene opportunities per hour of care may be high and the adherence rate may be high as well, the technique of hand hygiene may fail.[4] The guidelines include the recommendation that staff receive education on how, when, and why to perform hand hygiene in the discussion of strategies for successful implementation of hand hygiene in hospitals; the guidelines also contain detailed diagrams of the proper techniques for the use of alcohol-based hand rub, as well as soap and water (see Figure 6-1).

Observing Hand Hygiene Technique

Demonstrating proper hand hygiene practices to staff is one of the four critical aspects of a multidimensional hand hygiene program.[5] The IHI hand hygiene intervention package recommends that staff be observed to ensure that they use the proper volume of hand hygiene product for a sufficient amount of time, that they avoid recontamination of hands after hand washing by using a paper towel to turn off the faucet, and that they remove gloves by using correct technique so as not to contaminate hands.

Researchers have also noted variability in the amount of hand hygiene product used per hand hygiene episode and

Figure 6-1.
WHO Diagram of Proper Hand-Washing and Hand Rubbing Techniques



Source: World Health Organization (WHO): *WHO Guidelines on Hand Hygiene in Health Care (Advanced Draft): A Summary*. Geneva, Switzerland: WHO, 2006.

the thoroughness with which it is applied to the hands.[6,7] Widmer et al. conducted a prospective study in which they observed 180 health care workers in a university-affiliated geriatric hospital to evaluate the impact of a training program on proper hand hygiene technique using alcohol-based hand rub.[8] Before training, fewer than half used the alcohol-based hand rub correctly, failing to use the proper volume, applying it for too short a period of time, or not applying it to all surfaces of the hands. After training, the health care workers significantly improved their ability to use the alcohol-based hand rub correctly. This led the researchers to conclude that training in technique is key to health care workers' proper hand hygiene performance.

Monitoring how health care workers perform hand hygiene can be done during routine hand hygiene observation periods, or it can be part of competency assessment (see Chapter 3). Many organizations have periodic "competency days" or "skills days," during which staff review proper ways to perform various procedures that are part of routine care and patient safety. Examples include CPR or inserting an intravenous line. After watching a demonstration, staff members perform a return demonstration to show their ability to perform the procedure or technique properly. Incorporating the performance of proper hand hygiene, either using soap and water or alcohol-based hand rub in addition to glove removal, fits nicely into competency day agendas. You can observe staff to determine whether the proper amount of product is used, whether it is used for the necessary amount of time, and how well all surfaces of the hands and fingers are covered with the product.

Researchers have developed detailed data collection methodologies, audit tools, and scoring systems for assessing hand hygiene technique, as described in Text Box 6-1.

Physical Measurements of Hand Hygiene

Others have developed alternative methods to assess the thoroughness of hand hygiene performance:

- Taylor used a dye dissolved in 70% alcohol and poured 5 mL of the solution onto the cupped hands of a volunteer.[2] The volunteer then closed her eyes and "washed" her hands, as she normally would do using running water. At the completion of the timed wash, the researcher noted on charts, showing the front and back of a hand, the areas not covered by the dye. This method demonstrated to staff that hand washing was often done poorly: 89% of participants missed some parts of the hand surface, with parts of the thumbs, backs of the fingers, and backs of the hands most frequently missed.
- Aspock and Koller developed a series of exercises to teach students proper techniques that included hand washing as well as how to put on, use, and take off sterile gloves.[13] The exercises, which became part of the compulsory hygiene practices for medical students at Vienna University, are done in a stress-free atmosphere. One supervisor guides a group of up to 10 students through the exercises. The hand washing exercise involves washing hands using their usual technique with a cream-based dye while the students' eyes are closed. Students then open their eyes and can see by the dye what parts of their hands they missed.

In 2006 the infection preventionists at Amager Hospital in Copenhagen, Denmark, developed an audit tool to assess hand hygiene technique that could be used in a minimum amount of time and at minimal expense. This method requires staff to rub their hands with a fluorescent substance as they would normally do with alcohol-based hand rub, and place their hands under an ultraviolet light box to identify any areas they might have missed. Two infection preventionists administer the test and assess each person's performance. On average, it takes about seven minutes per health care worker to administer the test and to enter the data into a computer. The following scoring system is used to record the results:

- 0 points are given if areas are missed on the palms.
- 1 point is given if the palms are correctly covered but the health care worker misses areas at the dorsal side of the hands.
- 2 points are given if no area is missed, including the distal wrists.
- Staff are also checked for long sleeves, rings, bracelets, and watches:
  - 1 point is given if no long sleeves are worn. They define long sleeves as sleeves below the elbow.

Text Box 6-1.

Examples of Scoring Systems for Evaluating Hand Hygiene Technique

As part of a research project in the United Kingdom in1990, Dinah Gould (2004) developed a hand hygiene audit tool and scoring system that captured data including how long hands were washed or the alcohol-based hand rub was applied and whether all surfaces of the hands and fingers were covered. She followed an individual nurse for two hours.[9] The "Observation Audit Tool,"[10] shown here, was completed each time a hand hygiene opportunity was observed; whether hand hygiene was indicated was judged in context according to the activity they had just completed. The "Scoring System for Hand Hygiene Technique,"[11] also shown here, was used to measure the components of hand hygiene technique:

Observation Audit Tool

Observation Schedule—1 form to be completed for *every* contact with the patient/near patient environment for 2 hours

Contact no._____ Ward/Unit_____ Staff grade_____

Activity (described in full, e.g. handled bedclothes, urinary catheter):	
Hands decontaminated	Yes ___ No ___
Product	Hibisol___ Hibiscrub___ Soap___ None ___
Time (in seconds)	___
Surfaces decontaminated	Dorsal ___ Palmar ___ Interdigital ___
Drying	Thorough ___ Not thorough ___ Not dried___ N/A___
Pedal bin	Used correctly ___ Not used correctly ___ N/A ___
Gloves worn	Yes ___ No ___ Sterile ___ Not sterile___
Sharps	Recapped ___ Not recapped ___ N/A ___
Comments	
Activities classified as clean or dirty	

Text Box 6-1. (continued)

Examples of Scoring Systems for Evaluating Hand Hygiene Technique

Choice of agent:	No agent = 0 Inappropriate agent* = 6 Appropriate agent† = 12
Duration:	Hand washing—taken in seconds from the time the agent touched hands until hands rinsed Hand rub—taken in seconds from the time the agent touched hands until rubbing ceased
Number of hand surfaces decontaminated (dorsum, palm and interdigital spaces):	One hand surface decontaminated = 4 Two hand surfaces decontaminated = 8 Three hand surfaces decontaminated = 12
Drying (hand washing only)	Drying not attempted = 4 Not thorough = 6 Thorough (no residual moisture) = 12
Disposal	Hands not recontaminated = 12 Hands recontaminated by touching bin lid = 0

Taylor also developed evaluation criteria for hand washing; the criteria were scored from zero to two, depending on whether the technique was neglected, partially performed, or performed.[12] The 10 criteria included aspects such as the following:

- Use of soap (visible lather = 2; no contact with soap = 0)
- Rubbed hands together vigorously (vigorous rubbing = 2; minimal rubbing = 1; no rubbing = 0)
- Drying hands thoroughly (dried all surfaces = 2; dried one or two surfaces = 1; did not dry = 0)

* Chlorhexidine/hand rub on general wards other than during aseptic procedures.
** Chlorhexidine/hand rub on intensive care units.

— 1 point is given if no rings are worn.
— 1 point is given if no bracelets or watches are worn.

Staff are not interrupted during the test and are allowed as much time as they need before they put their hands into the ultraviolet light box. Individuals are given feedback on how they performed, and group feedback is given to each ward. Groups with lower scores are targeted for additional education during the following weeks.

Studies are needed that examine the effectiveness of evaluating technique through demonstrations and the extent to which demonstrated behavior corresponds with actual practice. Correlating these methods with microbiological assessments would strengthen the evidence base for these approaches.

Microbiological Methods for Assessing Thoroughness

Microbiological methods have been suggested for assessing hand hygiene thoroughness or effectiveness. Paulson et al. described three commonly used hand sampling methods to evaluate hand hygiene effectiveness, which are described briefly in Table 6-2.[14]

The WHO guidelines include a detailed discussion of the various methods used in Europe and the United States to test the activity of hand hygiene agents.[4] These approaches may be useful in clinical trials, but they can be expensive and cumbersome to execute.[4] Some of the simpler, less involved methods, such as the swab method or finger press method, may have an application as visual tools showing hand contamination for staff education purposes.

Table 6-1.
Commonly Used Hand Sampling Methods to Evaluate Hand Hygiene

Method	Description	Advantage	Disadvantage
Swab method	The test subject's palm and areas between the fingers or fingertips are swabbed with a pre-moistened cotton swab, which is streaked across an agar plate, for culture.	Relatively simple and inexpensive	Lack of reliability; cannot precisely measure quantities of marker organisms in order to estimate the true microbial population.
Palm and/or finger press method	The test subjects press their palm or fingertips directly onto an agar plate for culture.	Relatively simple and inexpensive	Lack of reliability; cannot precisely measure quantities of marker organisms in order to estimate the true microbial population.
Glove juice method	The test subject puts on surgical gloves, and a microbial stripping solution is instilled into the glove; the hands and fingers are massaged through the glove for one minute.	Can reliably measure quantities of marker organisms	More involved procedure than the previous two methods. The only method specified by U.S. regulatory agencies for evaluating the effectiveness of hand hygiene products (21 CFR Section 333.470, 1994). Includes germs on back of hand, which are less related to transmission risk.

Source: *Adapted from Paulson D.S., et al.: A close look at alcohol gel as an antimicrobial sanitizing agent.* Am J Infect Control *27:332–337, 1999.*

While an extensive review of *in vivo* methodologies is beyond the scope of this monograph, you can find information about how some researchers have used these methodologies in Appendix 6-1. If microbiologic methods are used, consider what actions will be taken when problematic organisms are found.

Other Aspects of Hand Hygiene: Nail Length, Artificial Nails, Wearing of Rings, and Glove Use

Nail Length and Artificial Nails

McGinley et al. found that the subungual areas of fingers have high concentrations of bacteria—especially Gram-negative rods and coagulase-negative staphylococci, yeast, and *Corynebacterium*—even after thorough hand washing or surgical scrubs.[15] Moolenaar et al. studied a prolonged outbreak of *Pseudomonas aeruginosa* in a neonatal intensive care unit and found an association between long natural nails and colonization with the same organism in one nurse.[16] Both the CDC and the WHO recommend keeping natural nails short (less than 1/4 inch long [CDC], less than 0.5 cm [WHO]; both are listed as a "suggested recommendations," or Category II, in their ranking of recommendations).[3,4]

Artificial nails have been studied by several researchers, and there is growing evidence that wearing artificial nails results in higher carriage of Gram-negative organisms and yeast.[17,18] Several outbreaks have been described in the literature.[16,19–22] The CDC and WHO guidelines recommend that staff having direct contact with high-risk patients not wear artificial nails or nail extenders.[3,4] (Both the CDC and the WHO rank the recommendation as 1A, the strongest evidence-based recommendation in their ranking system.)

Several of those who answered the Consensus Measurement in Hand Hygiene project survey said that they monitor aspects of nails as part of their organization's overall hand hygiene program. This aspect of their hand hygiene programs is summarized In Text Box 6-2.

Text Box 6-2.

Hospitals Monitoring Health Care Workers' Nails

Spartanburg Regional Healthcare System in Spartanburg, South Carolina, monitors health care workers' nails as part of their hand hygiene program:

- Nurse volunteers directly observe staff hand hygiene practices, including monitoring for the presence of artificial nails. The hospital's policy does not allow wearing of artificial nails.
- Hospital policy does not permit long natural nails, so managers and infection preventionists watch for this. Staff are instructed to hold their palm in front of their nose: If they can see their nails over the fingertips, they need to trim the nails (see picture below).

St. Clare's Hospital in Weston, Wisconsin, has a policy against staff wearing long nails or artificial nails or nail extenders. The policy went into effect at the same time the hospital opened a new facility in 2005, with all hired staff aware that the policy applied to all direct caregivers and those who supervise caregivers. The infection preventionist informally monitors the policy during routine rounds and counsels staff with artificial nails or nails that are too long. In the three years since the hospital opened, only a few employees have had to be approached about artificial or long nails, and most of the time, employees have voluntarily complied and either cut their nails or removed artificial ones. The human resource department's corrective action policy covers this aspect of hand hygiene adherence with a tiered enforcement protocol: Initially a verbal warning is given, then a written warning, followed by one to five days off without pay and potential termination if the employee does not correct the infraction.[23]

University Community Hospital in Tampa, Florida, monitors staff for nail length and artificial nails or extenders. In order to ensure a consistent approach throughout the 30 hospitals in the Tampa Bay area, the infection preventionists in all the hospitals developed and implemented policies at about the same time in 2000. The infection preventionists at University Community Hospital began by educating staff about the reasons for the nail policy, emphasizing how important it is for patient safety. While the infection preventionists and nurse leaders watch for any deviations from the policy, staff adherence has been very good, and infractions seldom occur. If a health care worker is suspected of wearing artificial nails, he or she is counseled by either infection preventionists or the nurse leader.

Brookhaven Memorial Hospital Medical Center in Patchogue, New York, has had a formal policy regarding nails since 2004. The policy states that the wearing of artificial nails or nail jewelry is not permitted for staff who provide patient care or handle patient care products or food. The policy also requires that nails be kept short enough to prevent puncturing of gloves or harm to patients. Recognizing the impact of the "show me" approach to education, before implementing the new policy, staff cultured health care workers' nails (both natural and artificial) after they washed their hands. They were able to show staff that there was a significantly larger bacteria count on the nails of those who wore artificial nails than on natural nails. Adherence to the nail policy has been consistently high; occasionally employees are identified wearing artificial nails, but when counseled, they have removed them. Observing for long or artificial nails is now part of the hospital's routine hand hygiene observation periods.

Wearing of Rings

Observation is often used to assess the wearing of rings and other jewelry. The relationship between wearing rings and the transmission of microorganisms is still unclear. The CDC guideline has categorized this as an "unresolved issue" in need of additional research[3]; the draft WHO guidelines also do not have a stated recommendation against the wearing of rings but note that "the consensus recommendation is to discourage the wearing of rings or other jewelry during health care."[4] A number of studies, however, have demonstrated that the skin under rings can be more heavily colonized than areas of the skin without rings and can be a major contributor to hand contamination.

- Trick et al. (2003) studied 66 surgical intensive care unit nurses, culturing each staff nurse's hands before and after he or she performed hand hygiene; they found that wearing rings was associated with a 10-fold higher median count of skin microorganisms, especially with yeast species or Gram-negative bacilli.[24] They also found a dose–response effect between ring wearing and contamination; the concentration of microorganisms increased as the number of rings worn increased.
- Hoffman and Cooke surveyed 50 nurses working on medical and surgical wards who permanently wore rings and studied the microorganisms isolated from skin under the rings.[25] Forty percent of these nurses (20 nurses) had Gram-negative bacilli on the skin under their rings, and 16 of these 20 nurses still had most strains each time the nurses were sampled during the five-month study.
- Salisbury et al. studied 100 hospital health care workers who worked on general medical and surgical units, excluding those who had used antimicrobial soap in the previous two weeks, had artificial nails, or were receiving antibiotics.[26] Each health care worker who wore rings was paired with a worker from the same unit who did not wear rings. Cultures were taken from the solution poured over each health care worker's hands as they performed a 60-second friction rinse, done both before and after a routine hand wash. Mean total colony counts for those who wore rings were higher before and after hand washing.

Other researchers have not found an association between wearing rings and increased colonization with bacteria:

- Waterman et al. studied health care workers in perioperative settings who wore rings and performed surgical scrubs to those who did not were rings.[27] They found no differences in the bacterial counts before or after surgery between the ring-wearing and non-ring-wearing study participants, and they concluded that there was no compelling evidence that wearing rings resulted in higher bacterial counts under gloves during surgery.
- Fagernes et al. studied health care workers involved in patient care who had not used antiseptic soap within 24 hours of their hand culture.[28] They found that wearing a single plain ring did not increase the total bacterial count on the hands.

Monitoring the Use of Gloves

Both the CDC and the WHO guidelines recommend that health care workers wear gloves to protect themselves from acquiring infections from patients as well as to protect patients from acquiring microorganisms that may be on the hands of health care workers; specifically, the guidelines recommend that health care workers do the following[3,4]:

- Wear gloves when in contact with blood or other potentially infectious body fluids, excretions, secretions (except sweat), mucous membranes, and non-intact skin.
- Remove gloves after caring for a patient; health care workers should not wear the same pair of gloves when caring for more than one patient.
- Change gloves during patient care when moving from a contaminated body site to a clean body site.

Wearing gloves does not provide complete protection, however, as hands can become contaminated via small defects in the gloves or during removal of gloves. Thompson

et al. studied glove use and hand hygiene practices in an observational study of health care workers in a long term care facility and noted that, while gloves were used in more than 80% of the interactions with patients when indicated, they were changed appropriately less than 20% of the time.[29] The CDC and WHO guidelines also emphasize that wearing gloves does not take the place of hand hygiene.[3,4] The evidence, considerations, recommendations, and key messages for glove use are specifically described in the WHO's *Information Sheet 6 on Glove Use*,[30] as part of the "Clean Care Is Safer Care" suite of tools. This information sheet clearly summarizes the WHO guidance on glove use for health care workers and presents a useful pyramid diagram that explains when gloves are indicated and what type of gloves are indicated. This information can be useful when considering the monitoring of glove use. The IHI recommends that staff competency be assessed regarding the use of alcohol-based hand rub and proper removal of gloves (so as not to contaminate hands with the contaminated glove surface).[5]

Monitoring of glove use by health care workers can be incorporated into routine hand hygiene observation periods. Glove use can also be incorporated into "skills days" or "competency days," as described earlier in this chapter, during which staff could describe the indications for wearing gloves or demonstrate proper removal of contaminated gloves.

Key Points, Chapter 6

- Assessing the thoroughness (technique) of hand hygiene by health care workers is as important as monitoring the action (done or not done) of hand hygiene.
- "Skills days" or "competency days" provide regular opportunities to demonstrate and practice proper hand hygiene technique.
- Other aspects of hand hygiene that can be monitored include nail length, artificial nails, wearing of rings, and proper use of gloves.

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Appendix 6-1.

Examples of Research Articles That Describe Microbiologic Methods for Assessing Hand Hygiene Technique

Author(s)/Article	Methodology	Type of Microbiologic Method	Description of Microbiologic Technique	Results
Kampf G.: How effective are hand antiseptics for the postcontamination treatment of hands when used as recommended? Am J Infect Control 36:356–360, Jun. 2008.	Hands of 16 volunteers were contaminated with Serratia marcescens. After a two-minute air-dry, the glove juice sampling procedure was done. The volunteers then washed their hands using a nonmedicated soap. Hands were recontaminated with inoculums of Serratia, and each volunteer then applied one of four different blinded hand rubs (each with a different concentration of ethanol) and rubbed his or her hands until dry. A control product (antiseptic hand wash) was similarly used. Repeat glove juice sampling was done following each product application.	Glove juice method	The researchers instilled 75 mL of sterile stripping fluid into each glove, and the volunteer's wrist was secured. The volunteer's hands were massaged through the glove by an attendant for 60 seconds. Aliquots of 5 mL of glove juice were removed from each glove and diluted in 5 mL of phosphate-buffered saline and diluted with product neutralizers. Spread plates and spiral plates were prepared from each dilution on tryptic soy agar and incubated at 30°C for 48 hours, at which time colony counts were done.	Only the hand rub containing 85% ethanol was as effective as the antiseptic hand wash product in reducing colony counts. The researchers also found that a higher volume of hand rub (3.6 vs. 2.4 mL) did not necessarily result in better coverage of the hands, believed to be related to the volunteers' insufficiently rubbing their hands with the product.
Kac G., et al.: Microbiological evaluation of two	The 6-month study used a crossover design in five wards of a 750-bed tertiary care university	Palm and finger press method	Before and after the HH procedures, palm and fingertips were pressed onto	A total of 50 HCWs participated in the study, with

Appendix 6-1. (continued)

Author(s)/Article	Methodology	Type of Microbiologic Method	Description of Microbiologic Technique	Results
hand hygiene procedures achieved by health care workers during routine patient care: a randomized study. J Hosp Infect 60:32–39, May 2005. Errata in J Hosp Infect 62:129, Jan. 2006.	hospital; 10 health care workers (HCWs) from each ward were randomly assigned to perform hand hygiene (HH) with an unmedicated soap and alcohol-based hand rub (ABHR); the two HH episodes were separated by six hours. Imprints of the palm and fingertips on the volunteer's dominant hand were taken at the same time before and within one minute following the HH procedure.		blood agar plates containing residual antiseptic neutralizers, using separate plates for each. Plates were incubated aerobically at 37°C for 48 hours, with colony counts at 24 and 48 hours. Colony counts were done on each plate, with the maximum count of 300 colony forming units. Plates with higher counts were considered confluent growth. Bacteria were identified using standard techniques.	200 cultures done (100 palms, 100 fingertips). Hand rubbing yielded a significantly greater reduction in the bacterial load than hand washing.
Pessoa-Silva C.L., et al.: Dynamics of bacterial hand contamination during routine neonatal care. Infect Control Hosp Epidemiol 25:192–197, Mar. 2004.	The study took place in a 20-bed neonatal unit in a large acute care teaching hospital. An imprint of the five fingertips of the dominant hand was obtained before and after HH, as well as at the end of a sequence of care.	Fingertip press	Commercial contact plates were used for the imprint of the five fingertips of the HCW's dominant hand. Fingertips were pressed for 3 seconds onto a plate. Plates were incubated in the laboratory at 35°C under aerobic conditions, and colony counts were read at 24 and 48 hours. A maximum colony count was fixed at 300 colony-forming units; anything beyond this was confluent growth and was not counted. Bacteria were identified using standard techniques.	A total of 398 samples were taken from HCW's hands, with 360 of them culture positive.
Lucet J.C., et al.: Hand contamination before and after different hand hygiene techniques: a randomized clinical trial. J Hosp Infect	The two-month study was done in seven wards, with five to seven volunteers chosen from each ward. Each volunteer performed six HH techniques in random order immediately following a health care procedure: • Hand washing with an antiseptic soap for 10, 30, and	Fingertip press	Trypticase-soy agar plates were used for the cultures, and fingertips were pressed onto the plates for 15 seconds each. Residual antiseptic activity was not inactivated in the culture media. Cultures were done both before and within 1	A total of 43 volunteers participated in the study, with a total of 516 cultures obtained (258 before and 258 after HH); 383 specimens were

Appendix 6-1. (continued)

Author(s)/Article	Methodology	Type of Microbiologic Method	Description of Microbiologic Technique	Results
50:276–280, Apr. 2002.	60 seconds • Hand washing with an unmedicated soap for 10 and 30 seconds • Hand rubbing with ABHR At least 6 hours separated HH episodes if they occurred on the same day. After each HH episode, all five fingertips on the dominant hand were pressed onto agar.		minute after the HH technique. Plates were incubated at 37°C under aerobic conditions; colony counts were done at 48 hours of incubation. As in the previous studies, colony counts were done up to 300 colony-forming units, after which growth was considered confluent. Bacteria were identified using standard techniques.	culture positive. Bacterial counts before HH were not significantly different. Bacterial counts after using the antiseptic soap or the ABHR were significantly lower than those obtained after washing with the unmedicated soap.
Doebbeling B.N., et al.: Comparative efficacy of alternative hand-washing agents in reducing nosocomial infections in intensive care units. N Engl J Med 327:88–93, Jul. 9, 1992.	Prospective crossover trial over eight months of 1,894 adult patients in three intensive care units (ICUs), with HCWs using either chlorhexidine or 60% ABHR or an optional use of a nonmedicated soap. Health care–associated infection rates and HH adherence were monitored prospectively.	Variation on glove juice method	Cultures were taken randomly from HCWs' hands in each unit after they had cared for a patient selected for observation. Each hand was placed in a separate sterile bag with 15 mL of tryptic soy broth supplemented with Tween 80, lecithin, sodium oleate, and sodium sulfite and agitated for 30 seconds. From each bag an aliquot of 0.1 mL was pipetted onto a trypticase soy agar plate, and an equal volume was pipetted onto a MacConkey agar plate. All plates were incubated at 35°C for 24 hours, after which colonies were identified using standard microbiologic techniques.	A total of 328 hand cultures were obtained after hand washing. The rate of hand carriage was lower for the chlorhexidine-washed hands than for hands rubbed with the ABHR. Overall, there was a nonsignificant trend for fewer infections in the group of patients cared for by HCWs who washed with chlorhexidine
Larson E.L., et al.: Quantity of soap as a variable in handwashing. Infection Control 8:371–375, Sep. 1987.	One aspect of this study used 40 healthy adult volunteers, who were randomly assigned to one of four hand washing agents: • Antiseptic containing chlorhexidine • Two ABHRs • A liquid non-antimicrobial soap	Variation on glove juice method	Test subjects inserted their dominant hand into a sterile polyethylene bag containing 50 mL of sterile distilled water containing lecithin, sodium thiosulfate, sodium oleate, protease peptone, tryptone, and Tween 80. The entire hand	There were significant reductions in colony forming units between hand washing products, and the volume of product used (3 mL yielded greater

Appendix 6-1. (continued)

Author(s)/Article	Methodology	Type of Microbiologic Method	Description of Microbiologic Technique	Results
	Within each group, subjects were assigned to use either 1 mL or 3 mL of soap or rub per hand wash. Each subject washed his or her hands 15 times per day for 5 days.		surface was rubbed vigorously through the wall of the bag for 3 minutes. A 0.1 mL volume of each of serial dilutions was placed on trypticase soy agar containing yeast extract, Tween 80, and 5% sheep blood. Plates were incubated at 37°C for 48 hours, and colonies were counted.	reduction than 1 mL).
Hoffman P.N., et al.: Micro-organisms isolated from skin under wedding rings worn by hospital staff. BMJ 290(6463):206–207. Jan. 1985.	Fifty nurses who worked on medical and surgical wards who permanently wore rings participated in the research study. Rings were removed, and the investigators swabbed the skin underneath with a swab that neutralized any residual antiseptics. A similar area on a non-adjacent finger on the same hand was similarly swabbed as a control site. Nurses whose ring sites grew Gram-negative bacteria had additional samples taken from the same sites over a five-month period of time. At the end of the study, samples were taken from all nurses still working at the hospital.	Swab method	Swabs were streaked onto plates containing casein, yeast extract, lactose and glucose agar, and MacConkey agar; Gram-negative bacilli were identified using standard techniques. The lower limit for detection was 10 colony-forming units.	Gram-positive organisms were significantly increased at ring sites (mean of 1,600/swab from skin under rings versus 180/swab from control sites, $p < 0.001$). Twenty of the 50 nurses also had Gram-negative organisms on the skin under their rings, with a mean of 730/swab; 16 of the original 20 nurses also had Gram-negative bacilli on at least one occasion over the 5-month study. Bacteriophage and serological typing of the organisms showed the same strain to be persistently isolated from most test subjects.

chapter 7

International Hand Hygiene Measurement Tools and Improvement Efforts: Leading the Way to Broadscale Change

"Hand hygiene is the entrance door to better infection control and safer patient care."[1]

There is great global interest in improving hand hygiene adherence. This chapter describes only a few of the many initiatives that are under way, with an emphasis on the measurement tools and approaches used by the World Health Organization (WHO) and those used in Australia, Canada, England, and Scotland. Most of the tools are publicly available and are well worth considering for use in your organization. Most tools have been widely field tested, and reliability and validity have been established for many of them when used in conjunction with the available training programs. Excerpts from several of these tools are included in the Tool Appendix.

Worldwide Efforts: The WHO Global Patient Safety Challenge, "Clean Care is Safer Care"

In 2004, The WHO World Alliance for Patient Safety (WAPS) initiated a global response to the problem of health care–associated infection.[2] The overall aim is to reduce health care–associated infection by strengthening practices in the areas of blood safety, infection safety, and clinical procedure safety, as well as water, sanitation, and waste management safety. The leader of the Global Patient Safety Challenge initiative is Professor Didier Pittet, M.D., M.S.

A major emphasis of the initiative is the promotion of hand hygiene in health care. The first Global Patient Safety Challenge, "Clean Care is Safer Care,"[3] launched in October 2005, has expanded educational and promotional tools developed initially for the Swiss national hand hygiene campaign to a worldwide program. The initiative aims to do the following:

- Increase global awareness of health care–associated infections as a serious issue for patient and health care worker safety.
- Stimulate countries to commit to making progress in these areas.
- Identify and test sound recommendations and strategies to improve infection control interventions in health care settings worldwide.[4]

As of September 2008, this challenge to curb the spread of infection through better hand hygiene has been accepted by governments in more than 120 countries, representing more than 85% of the world's population. Early results demonstrate significant improvement in hand hygiene compliance in all settings where the WHO Hand Hygiene Improvement Strategy has been implemented, in particular in Australia, Belgium, Hong Kong, Italy, Mali, and Switzerland.

As part of the "Clean Care is Safer Care" initiative, the WHO developed guidelines for hand hygiene that include a five-part multimodal hand hygiene improvement strategy for organizations to implement. The improvement strategy includes the following:

- Structural system changes, such as making alcohol-based hand rub available at the point of care
- Training and education
- Observation of hand hygiene performance and feedback

- Reminders in the workplace
- Creation of a safety culture

A separate document, the "Guide for Implementation" of the five-part multimodal improvement strategy, is a step-by-step guide to implementing change. It includes a toolkit with detailed forms, instructions, educational posters, measurement tools, and an observation tool. The guide and all tools and materials are currently available in the "Pilot Implementation Pack," which your organization can receive by enrolling as a test site at http://www.who.int/gpsc/country_work/application_form/en/index.html. Several of these tools, such as surveys, are described in previous chapters, including Chapter 5.

The WHO validated the improvement toolkit in sites in the six WHO regions of Africa, America, Eastern Mediterranean, Europe, Southeast Africa, and the Western Pacific areas. The final WHO "Guide for Implementation" and associated tools will be available to the public on the WHO Web site during 2009.

WHO Observation Tool

The observation tool "Manual for Observers," included in the WHO "Guide for Implementation" toolkit,[5] was reviewed as part of the Consensus Measurement in Hand Hygiene project and deserves special mention:

- It is user-friendly but also quite sophisticated.
- It collects data at the level of each hand hygiene opportunity.
- For each opportunity, you can record the hand hygiene indication associated with the five moments, what the action was (wash, rub, or missed), and the professional category of the person observed.
- It has been used and validated extensively and translated into several languages.
- It has been used as a model for instrument development for nationwide hand hygiene promotion campaigns in more than 25 countries, including Australia, Canada, and the United Kingdom.

Detailed instructions for training observers are included in the toolkit.

National and Regional Efforts

National or regional officials in many countries are leading large-scale measurement and improvement initiatives in several countries, often in conjunction with the WHO Global Patient Safety Challenge. A few of these initiatives are described below.

England and Wales: "clean**your**hands" Campaign

The "clean**your**hands" campaign, launched in England and Wales by the National Patient Safety Agency (NPSA) in April 2005,[6] is modelled on the Geneva campaign.[7] It is a four-year program to address the many complex reasons behind low adherence to hand hygiene guidelines and involves the use of alcohol-based hand rub near the patient, posters, patient empowerment materials, and audits and feedback every six months. Each National Health Service (NHS) acute care trust (hospital) received a toolkit to help deliver the campaign. More information and tools used in the campaign are available at http://www.npsa.nhs.uk/cleanyourhands/.

The "clean**your**hands" campaign has been highly successful. Procurement of soap and alcohol-based hand rub has tripled; results as of December 2007 show that each extra 1 mL of hand rub per patient bed day was strongly associated with a 1% reduction in rates of methicillin-resistant *Staphylococcus aureus* (MRSA) bacteremia. Preliminary results from the National Observational Study to Evaluate the clean**your**hands Campaign (NOSEC) study that is independently evaluating the campaign's effectiveness can be found in Stone et al.,[8] with the most recent results available at http://www.idrn.org/nosec.php and http://www.npsa.nhs.uk/cleanyourhands/in-hospitals/independent-evaluation/nosec.

The Hand Hygiene Observation Tool

The NOSEC researchers are conducting a three-year cluster randomized controlled trial of a feedback intervention to improve compliance on 64 wards in 16 hospitals across England. In order to standardize observation measurement for the trial, Stone and colleagues[8] developed the Hand Hygiene Observation Tool.[9] Standard operating procedures in the form of a training instruction manual, which

includes a simplified tool and rules for classifying hand hygiene behavior more completely, were also developed. The training materials are extensive, and you should expect to spend one to three hours training each observer on the use of the Hand Hygiene Observation Tool. The Hand Hygiene Observation Tool and standard operating procedures are available on the NOSEC Web site, http://www.idrn.org/nosec.php.

The Hand Hygiene Observation Tool allows you to collect data according to the level of risk of each patient contact (for example, before a low-risk contact, after high-risk contact) and to record when episodes of hand hygiene behavior were difficult to observe. Instructions include how to avoid the issue of double counting (after one patient and before the next) and how to conduct structural counts of the number of soap and alcohol dispensers present.

General recommendations for data collection with the Hand Hygiene Observation Tool include observation for at least 20 minutes per session and the observation of at least 15 hand hygiene episodes per session. Within the Feedback Intervention Trial, observation occurs one hour per month, at the same time each month, on each of the 64 wards.

The interrater reliability of the Hand Hygiene Observation Tool was assessed based on 1389 observations. A description of the methodology used to assess reliability is included in Text Box 3-8 in Chapter 3, and further information is available in McAteer et al.[9]

Ontario, Canada: "Just Clean Your Hands" Program

Ontario, Canada's "Just Clean Your Hands" program[10] is an evidence-based hand hygiene program that builds on the work done by the WHO and the United Kingdom. As a provincewide hand hygiene program, it is available to all acute care settings in Ontario. Like the WHO campaign, the improvement program incorporates a communications toolkit, ways to demonstrate senior management and administration support, and information on environmental modifications, champions and role models, education of health care workers, and observation and feedback. The "Just Clean Your Hands" program, along with a current reference list and frequently asked questions, can be downloaded from http://www.justcleanyourhands.ca. The program was pilot tested in 10 Ontario hospitals from December 2006 to August 2007. It was launched in March 2008, with regional training sessions across the province.

A comprehensive hand hygiene program, which includes a set of data collection tools and training materials, was developed as part of the "Just Clean Your Hands" program, under the direction of Clare Barry and Liz McCreight in the Ontario Ministry of Health and Long-Term Care. The program includes an implementation guide; train-the-trainer sessions; tools and materials such as online training modules, a hand care program, and posters; an audit process and observation tool; a Web site (http://www.justcleanyourhands.ca), and support and guidance from the ministry staff during and after program implementation.

The Canadian Patient Safety Institute started the national "STOP! Clean Your Hands," campaign in 2007.[11] The Canadian Patient Safety Institute has adopted the Ontario audit tool and training component as part of its national campaign.

Ontario Observation Tool

The Ontario observation tool, which was adapted from the WHO observation tool, clearly defines the indications to observe; it can be used to observe single or multiple types of indications at the same time. It allows you to calculate adherence rates separately for each type of indication and each health care worker category (for example, nurses performed hand hygiene before patient care, 80% adherence; physicians performed hand hygiene after patient care, 80% adherence). The numerator (the number of times hand hygiene was performed for a specific indication/specific health care worker category) and denominator (the number of observed hand hygiene indications for specific hand hygiene indications observed) are reported separately for each type of indication and each health care worker category; this provides data for developing targeted and appropriate interventions to improve adherence. Developers of the tool recommend *not* reporting overall facilitywide rates because they can be misleading and

difficult to interpret, as adherence for the different indications for hand hygiene and adherence by the different types of health care workers can vary widely across the facility and by health care worker type.

A hallmark of this program is the importance and thoroughness of training materials. The training material includes a PowerPoint presentation on hand hygiene and a DVD with 15 simulated clinical situations for the trainee to observe and check off hand hygiene observations. An answer sheet allows an observer to compare his or her answers to the correct responses. The developers estimate that training an observer takes between three and six hours.

The interrater reliability of the Ontario tool was tested using two pairs of trained observers and found to be 94%, based on 56 observations over two weeks during 20-minute observation periods. The tool developers recommend reassessing reliability at regular intervals and whenever new staff are collecting data.

New South Wales, Australia: "Clean Hands Save Lives" Campaign

The 12-month "Clean Hands Save Lives" campaign was a joint initiative of the Clinical Excellence Commission and the New South Wales Department of Health. Changes introduced by the campaign were designed to assist in the implementation of existing evidence-based guidelines and to aid health facilities in addressing identified problems and barriers associated with current local hand hygiene activities.[12]

The "Clean Hands Save Lives" campaign, launched in March 2006, was designed to reduce multiple-drug-resistant organism (MDRO) infections through improving hand hygiene adherence. Combining campaign methodologies from a variety of sources,[7,13–15] the "Clean Hands Save Lives" campaign used a multimodal approach to increase the use of alcohol-based hand rubs and, as a result, reduce MDRO infections. In addition, this campaign used regular feedback on hand hygiene performance to improve hand hygiene adherence. Strategies employed included the following:

- Project officers were appointed to each area health service to coordinate local campaigns.
- Dissemination of campaign collateral materials was linked to key messages of the campaign.
- The University of Geneva Hospitals "Talking Walls" strategy was adapted for worldwide use by the WHO.[7]
- Alcohol-based hand rubs were placed at the point of patient care in each facility to help busy staff decontaminate their hands before and after patient contact.
- Alcohol-based hand rub usage and distribution were measured through facilities in New South Wales.
- Adherence to hand hygiene guidelines was audited, and staff were given feedback on their performance.

New South Wales Data Collection Tools

Standardized data collection tools were used to assist staff in evaluating local implementation of the "Clean Hands Save Lives" campaign and provide de-identified data for statewide aggregation and analysis. The tools and instructions used for observation, feedback, and training are available at http://www.cec.health.nsw.gov.au/pdf/cleanhands/report/appendix14.pdf.

During the campaign, known independent observers collected data in 20-minute observation periods, recognizing that the Hawthorne effect is inherent in this approach. At the end of the 20 minutes, data collectors gave verbal and written feedback to staff, using a structured form. Data collection staff were advised to stress the positive findings first; if there were negative findings, they gave examples and suggestions for improvement, and they asked staff to explain why they did not adhere to guidelines.

The New South Wales observation form lists specific tasks as opportunities for transmission in low-, medium-, and high-risk categories. For example, low risk includes making clean beds and having contact with notes, telephones, or computers; medium risk includes moving a patient into or out of bed and donning and removing gloves; high risk includes suctioning, phlebotomy, and being exposed to bodily secretions. Risk categories were based on the Fulkerson risk scale.[16]

Campaign Achievements

According to the final report, the New South Wales "Clean Hands Save Lives" resulted in the following achievements:

- There was a 15.1% improvement in hand hygiene adherence across all professional groups in New South Wales health facilities, with the greatest improvement (27.1%) in low-risk hand hygiene behaviors.
- The availability of alcohol-based hand rubs in patient care areas was improved to 70% of all available acute beds.
- An increased number of staff reported understanding and having knowledge of hand hygiene, which was reflected in observed hand hygiene adherence.
- Staff confidence in using alcohol-based hand rubs increased by 17.9% by the end of the campaign.
- The number of MDRO infections decreased. In particular, MRSA infections in intensive care unit patients' sterile body sites decreased from 5.28 per 10,000 occupied bed days to 3.92 per 10,000 occupied bed days.

Interestingly, results from a statewide follow-up audit showed that health services areas that continued to monitor and audit hygiene in their hospitals showed additional improvement in adherence, while areas that stopped monitoring hand hygiene showed a decrease to nearly pre-campaign levels.[17] More information about campaign achievements is available in the "Clean Hands Save Lives" final report.[12]

Health Protection Scotland: "Germs. Wash Your Hands of Them"

Scotland's national hand hygiene campaign, "Germs. Wash Your Hands of Them," was launched in January 2007 and is being delivered by Health Protection Scotland on behalf of the Scottish Government Health Directorate.[18] It is part of a pledge to the WHO Global Patient Safety Challenge, "Clean Care is Safer Care." This campaign is the first of its kind in the United Kingdom, and its core aim is to improve hand hygiene and reduce avoidable illness by using a social marketing approach. Scotland's campaign is unique in that it is aimed at both the general public and health care staff. The campaign has two key elements, both of which aim to achieve sustainable change in culture:

- A public campaign using TV and press advertisements, including material that specifically targets children. An initial evaluation of this campaign found that it was successful in many areas. For more information, visit http://www.washyourhandsofthem.com/campaign/campaign_evaluation.html.
- A second campaign aimed at raising awareness among NHS staff, patients, and visitors ran alongside the public campaign. The third phase of work will continue through March 2011. Additional information about the health care campaign is available at http://www.scotland.gov.uk/Topics/Health/NHS-Scotland/19529/2005.

Additional information and quality improvement resources related to hand hygiene, including an interactive coaching online quiz and sample policies, are available at the Healthcare Associated Infection & Infection Control Resource Centre for the hand hygiene model infection control policy, at http://www.hps.scot.nhs.uk/haiic/ic/handhygiene.aspx.

Data Collection Tools and Auditing Method

Following a review of available hand hygiene audit tools, the Scotland national campaign received permission to adapt a tool used by the Infection Control Nurses Association. An electronic tool was developed and installed on tablet personal computers that were provided to all local health board coordinators for auditing. The Scottish government funded one local health board coordinator for each NHS area. The government audited for adherence to the WHO's "Five Moments for Hand Hygiene" (shown in Figure 1-1 in Chapter 1). The electronic tool incorporated data quality assurance features designed to reduce the risk of missing data or illogical entries.

The Scottish government also produced a National Minimum Audit Dataset Protocol and Resource Pack to complement the audit tool, which contained detailed definitions and a standardized approach to data collection. Extensive training was provided for auditors and other associated infection control staff, including observation of

health care activities on video while the local health board coordinators completed an audit in real time.

During data collection, the auditors were instructed to be unobtrusive and state that they were in the area to observe aspects of infection control practices rather than hand hygiene specifically. An individual audit was defined as the monitoring conducted in one physical location, such as observations taking place on one ward. Each auditor completed an audit of 20 opportunities within one day, and 10 audits were performed during the two-week mandatory audit period.

Campaign Achievements

In November 2007, the Cabinet Secretary for Health and Well-being set a target goal of at least 90% adherence by November 2008 . Health Protection Scotland has published the *Compliance with Hand Hygiene Audit Report* based on the first four periods when local health board coordinators undertook audits throughout their NHS boards.[18] This report was one of the first to present hand hygiene adherence at the country level.

Data released in October 2008 present national findings, as well as results, stratified by local health directorate and type of health care worker. There has been continued improvement in adherence from each audit period to the next, with statistically significant improvements over time ($p < .001$). For example, countrywide compliance in 2007 increased from 68% to 87% and then in 2008 from 88% in Quarter 1 to 90% in Quarter 2. Because there is local variation in adherence, activities are under way to target initiatives based on local assessments of need. In summary, hand hygiene compliance within NHS Scotland is improving. Continued focus will be required to support compliance with the target of at least 90% to ensure long-term sustainability in all NHS boards.[18]

Testing of a Measurement Tool for Use in Developing Countries

Pashman et al. sought to design and test an easy-to-use hand hygiene surveillance instrument for hospitals in developing countries.[19] They pilot tested the instrument for three months in nine hospitals in China as part of the WHO initiative in Beijing. The materials included a step-by-step, detailed instruction manual for implementing robust surveillance methods. The form also included an assessment of structural factors such as availability of soap, alcohol-based hand rub, and towels.

Pashman et al. focused on measuring four essential opportunities: after patient contact, before patient contact, after contact with environmental surfaces within a patient's immediate area, and after removal of gloves. The form captures the type of personnel (physician, nurse, other clinical, and other nonclinical) and thoroughness of hand hygiene action (for example, washing > 15 seconds, washing < 15 seconds, using alcohol-based hand rub). For each observation session, the observer was instructed to obtain data on at least 10 hand hygiene opportunities. The tool is available in Pashman et al.[19]

Key Points, Chapter 7

- Many international hand hygiene improvement initiatives that are under way were stimulated by the WHO WAPS Global Patient Safety Challenge initiative launched in 2005.
- International hand hygiene improvement initiatives have invested considerable time and effort in developing and testing valid and reliable measurement tools and training programs.
- Many toolkits are publicly available online and should be considered for use when searching for rigorous measurement tools and methods.

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chapter 8

Displaying and Interpreting Hand Hygiene Data for Maximum Effectiveness

Once you have selected your measurement method(s) and begun to collect data, the next challenge you will face is how best to display your results. It is important to design your data display as an effective tool that communicates results, is easy to interpret, and easy to use. This chapter considers some of the ways that you can approach displaying data and provides some examples from health care organizations.

Creating a Hand Hygiene Dashboard

A quality dashboard is a data visualization tool for reporting information about related key performance indicators to leadership and customers. A dashboard provides a quick, at-a-glance summary of a process and/or product performance, which is often desired by top management and boards of directors.[1]

A hand hygiene dashboard can be organized according to the Donabedian framework of structure, process, and outcome.[2,3] The dashboard can include structural measures of the availability of alcohol-based hand rub or liquid soap dispensers and gloves, together with the traditional process measures, such as the observed percentage of hand hygiene actions compared with hand hygiene opportunities, and outcome measures such as patient satisfaction with hand hygiene or infection rates. A mock hand hygiene dashboard is provided in Figure 8-1.

Reporting Data by Unit and Type of Health Care Worker

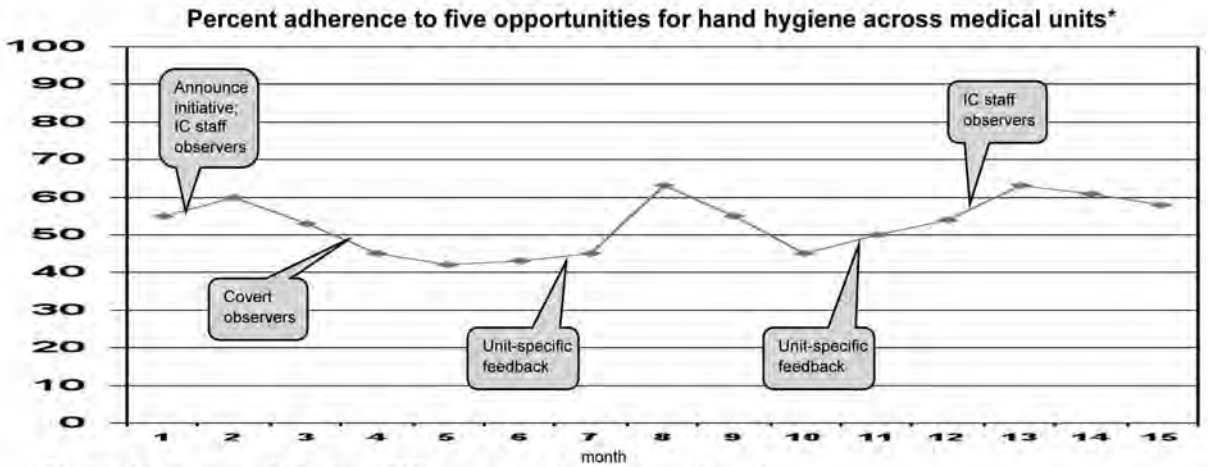
One of the most dramatic lessons learned by leaders of the multisite improvement initiative in Ontario, Canada—"Just Clean Your Hands" program[4]—relates to how adherence rates are reported. After pilot testing, the leaders recognized that overall facilitywide rates were not useful for identifying opportunities for improvement.[5] Instead, they realized that data are most useful when stratified and reported by subgroups, such as specific hand hygiene indication or type of health care worker. As shown by research studies summarized in Appendixes 3-2 and 3-3 in Chapter 3, stratified rates allow you to identify problem areas and focus training efforts.

Several examples of reporting data by unit and discipline were received in response to the Consensus Measurement in Hand Hygiene project call for measurement methods, a few of which are displayed in Text Box 8-1.

Statistical Process Control Charts

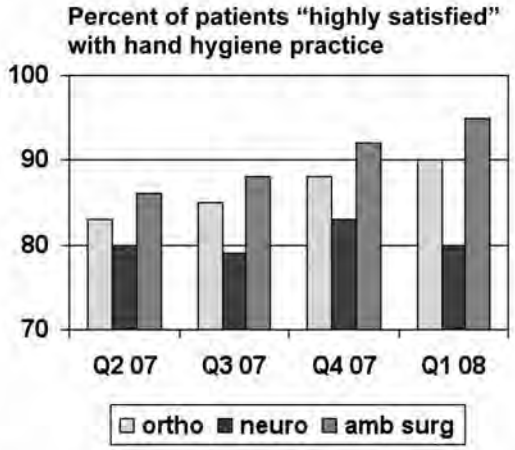
Statistical process control charts are useful for showing trends in data over time and determining whether changes in rates are the result of specific interventions (special cause) or normal variation (common cause).[6] Control charts display variability in performance of a process or system and allow users to determine when to intervene. Additional information about control charts can be found in Carey and Lloyd.[7] Text box 8-2 provides an example of how one health system uses control charts for monitoring hand hygiene.

Figure 8-1.
Mock Hand Hygiene Dashboard, First Quarter 2008



*Monthly data beginning 1/07; at least 200 opportunities observed per data point

Structural Audit date__ Dept.	# beds	# ABHR dispensers available	Number dispensers functioning and filled	# hand hygiene posters
MICU	10	20	20	1
SICU	6	12	10	0
CCU	8	15	13	0
Ortho	20	25	20	3
Neuro	25	18	17	1



Associating Process Measures of Hand Hygiene with the Outcome of Infection Rates

Some organizations monitor hand hygiene adherence rates along with health care-associated infection rates. Text Box 8-3 describes one hospital that has done this.

While monitoring infection rates along with the processes of hand hygiene can be useful, drawing conclusions about both deserves a bit more discussion. A number of researchers have conducted systematic reviews of the link between hand hygiene and infection rates. Appendix 8-1 provides examples of studies that examine the relationship between hand hygiene and infection rates. The updated WHO guidelines also contain a table that reviews all studies with significant impact on health care–acquired infections in campaigns worldwide.[8]

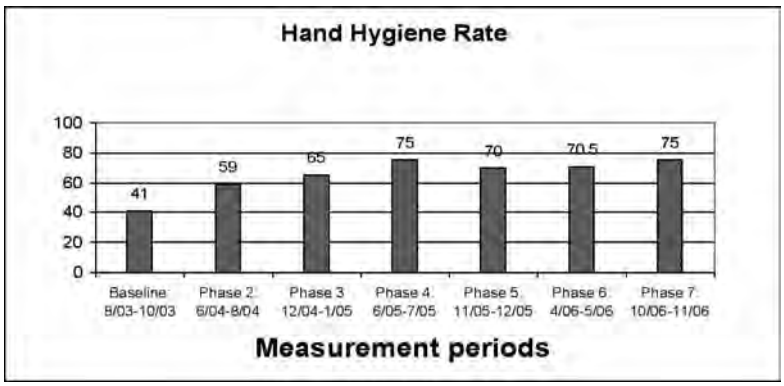
While many studies infer a relationship between hand hygiene practices and infection rates, fewer have identified

Text Box 8-1.

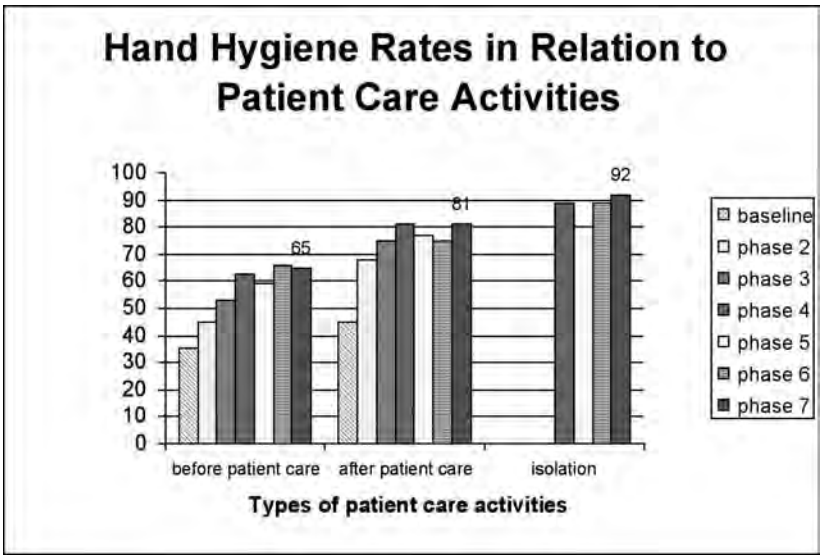
Examples of Data Displays Across Different Levels of Analysis

Park Nicollet Methodist Hospital, St. Louis Park, Minnesota
Park Nicollet Methodist Hospital reports hand hygiene adherence rates over time, according to the observed hand hygiene opportunities, and by health care worker discipline:

Do we clean our hands when we should?
The overall hand hygiene rate depicted in the following graph shows that the adherence rate was 75% in phase 7; this is an improvement over Phase 6.

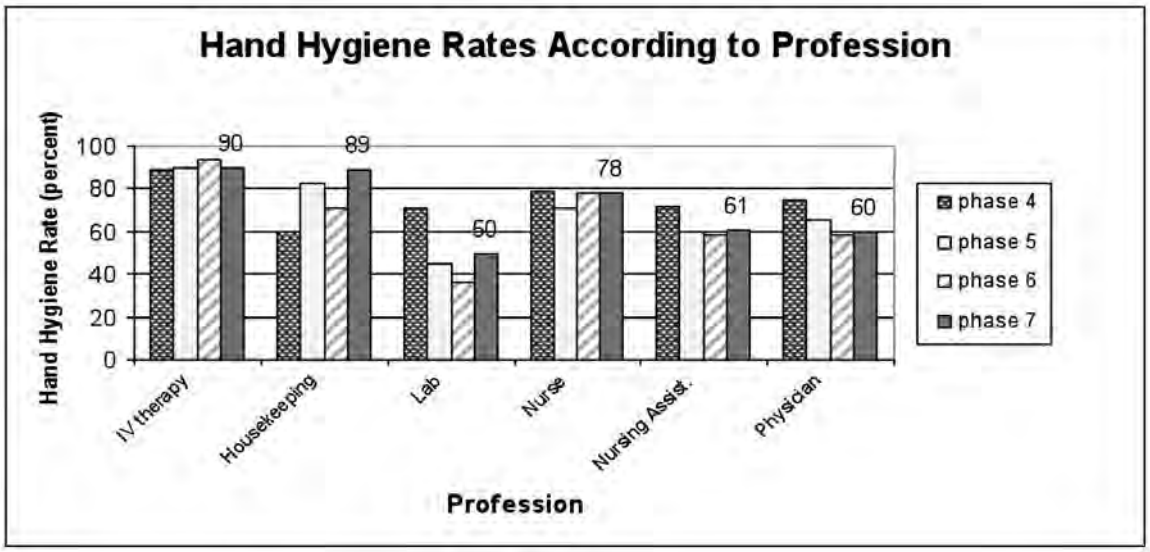


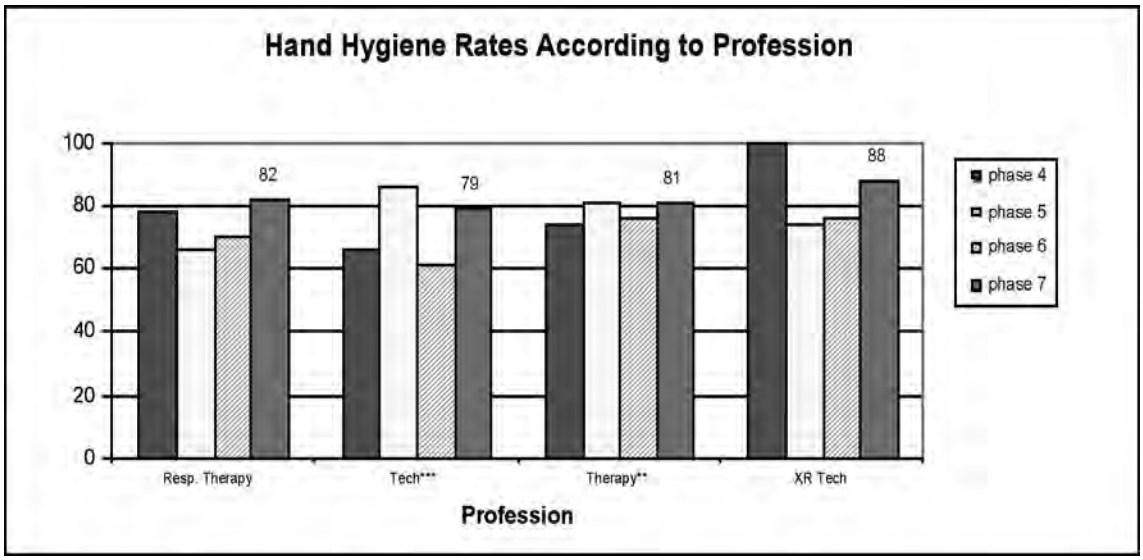
When do we clean our hands?
The following graph shows three specific times when health care workers can do hand hygiene: before patient care, after patient care, and when patients are in isolation. After significant initial improvement, hand hygiene before patient care continues at a rate of around 65%.



Text Box 8-1. (continued)

Who cleans their hands?
The following graphs show hand hygiene rates according to professional groups (IV Therapy, Housekeeping, Lab, Nurse, Nursing Assistant, Physician, Respiratory Therapy, Technicians, Therapists, and Radiology Technicians).

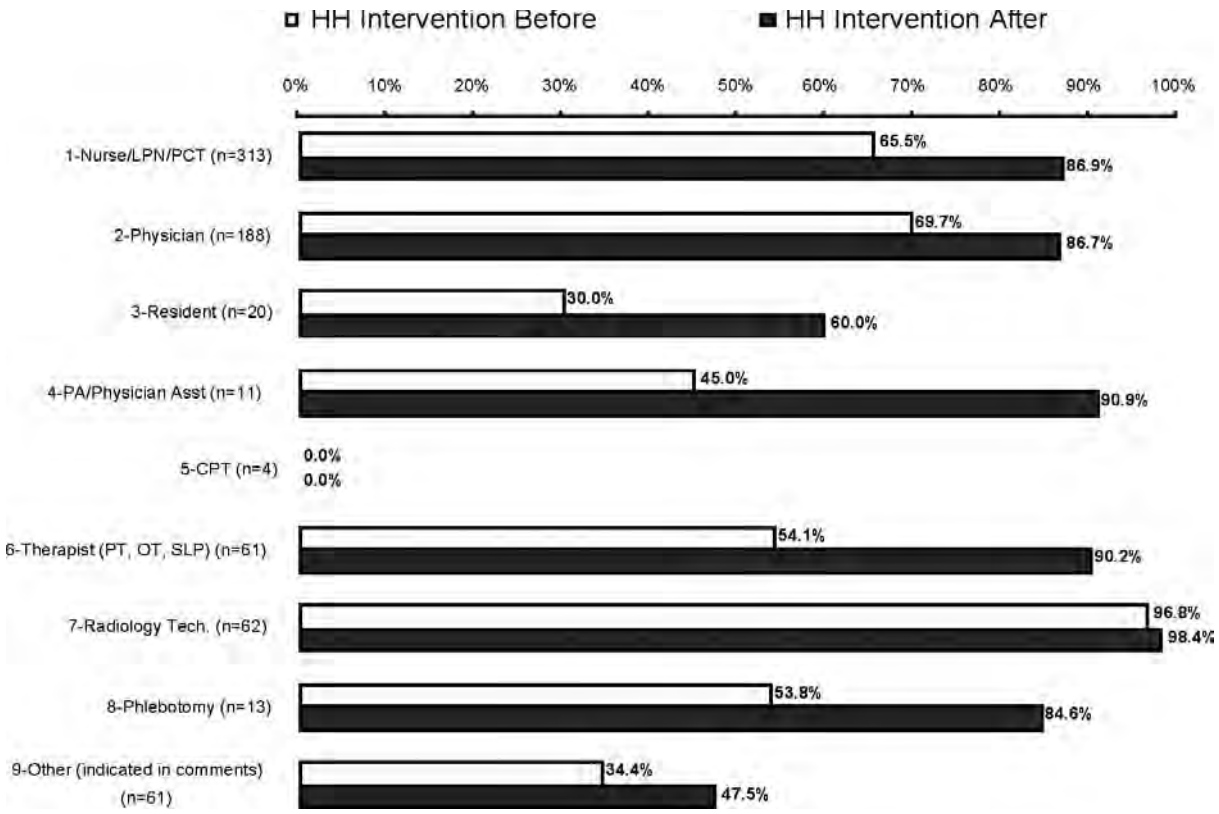




Text Box 8-1. (continued)

Spartanburg Regional Healthcare System, Spartanburg, South Carolina
Spartanburg Regional Healthcare System reports data stratified by type of health care worker and observed hand hygiene opportunities (hand hygiene before patient care, hand hygiene after patient care):

OVERALL Compliance by Job Title March–April 2006 (*n* = 733)
Before: 63.8%
After: 83.6%

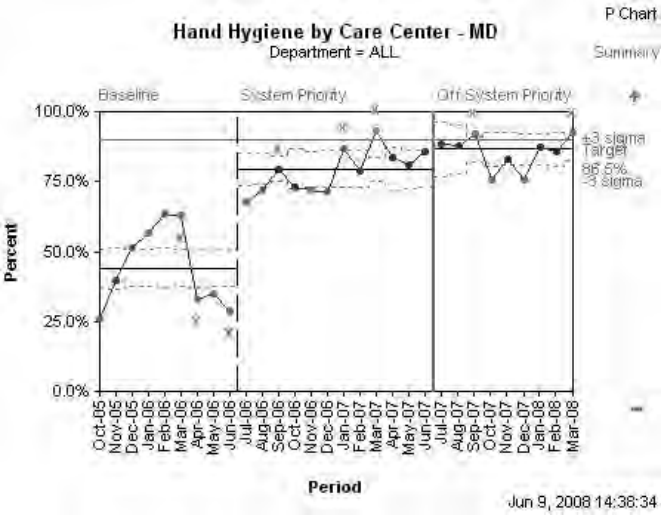


Text Box 8-2.

System-wide Statistical Process Control Charts

Bellin Health System, an integrated health care delivery system based in Green Bay, Wisconsin, serves 450,000 people in northeastern Wisconsin and the Upper Peninsula of Michigan. Bellin's commitment to quality improvement began in the late 1980s, when few health care organizations were interested in quality improvement concepts. Bellin now embraces an integrated measurement system based on the plan-do-check-act (PDCA) cycle, using statistical process control (SPC) charts to track its processes for stability and response to its improvement initiatives. Bellin uses hundreds of SPC charts to track performance across multiple locations.

In order to streamline its indicator reports and reporting process, in 2005 Bellin began using a performance improvement software system. This system allows easy, understandable information to be readily accessible on the organization's intranet; there are no paper reports and no waiting for meetings to distribute results. When graphs are updated, the graph "owners" (department or unit manager and the quality assurance [QA]/quality improvement [QI] representative) receive an e-mail alert; at the division level, the hand hygiene SPC charts go to the infection preventionist and the vice president. The charts include a definition of each measure and who to contact for questions. Owners can annotate the graphs, to note when it mounted alcohol-based hand rub dispensers outside the patient rooms. One example of Bellin's hand hygiene SPC charts is shown here.



a statistical association. According to Larson et al., "the multi-factorial determinants of who does or does not acquire an infection under certain circumstances means that an x percentage increase in handwashing does not necessarily result in a predictable, or even a measurable, reduction in the risk of infection."[9(p. 15)] Vandenbroucke-Grauls describes an association between hand hygiene and infection rates as "circumstantial."[10]

Nevertheless, the Centers for Disease Control and Prevention guidelines, WHO guidelines, and several authors of review articles argue that the evidence for an association is well established.[3,11] Larson reviewed 423 articles from 1879 through 1986 and found that most elements for causality, including temporality, strength, plausibility, consistency of the association, and dose response, were present.[12] Stone et al. present a table of nine studies that demonstrate improved outcomes attributable to hand hygiene.[13] In a review of the studies from 1977 to 1998, Larson concludes that, despite some methodological flaws and data gaps, evidence for a causal relationship between hand hygiene and reduced transmission of infections is convincing.[14] Larson proposed a four-level scoring tool for evaluating the quality of the studies published in 2004 that evaluated interventions to reduce infections.[15]

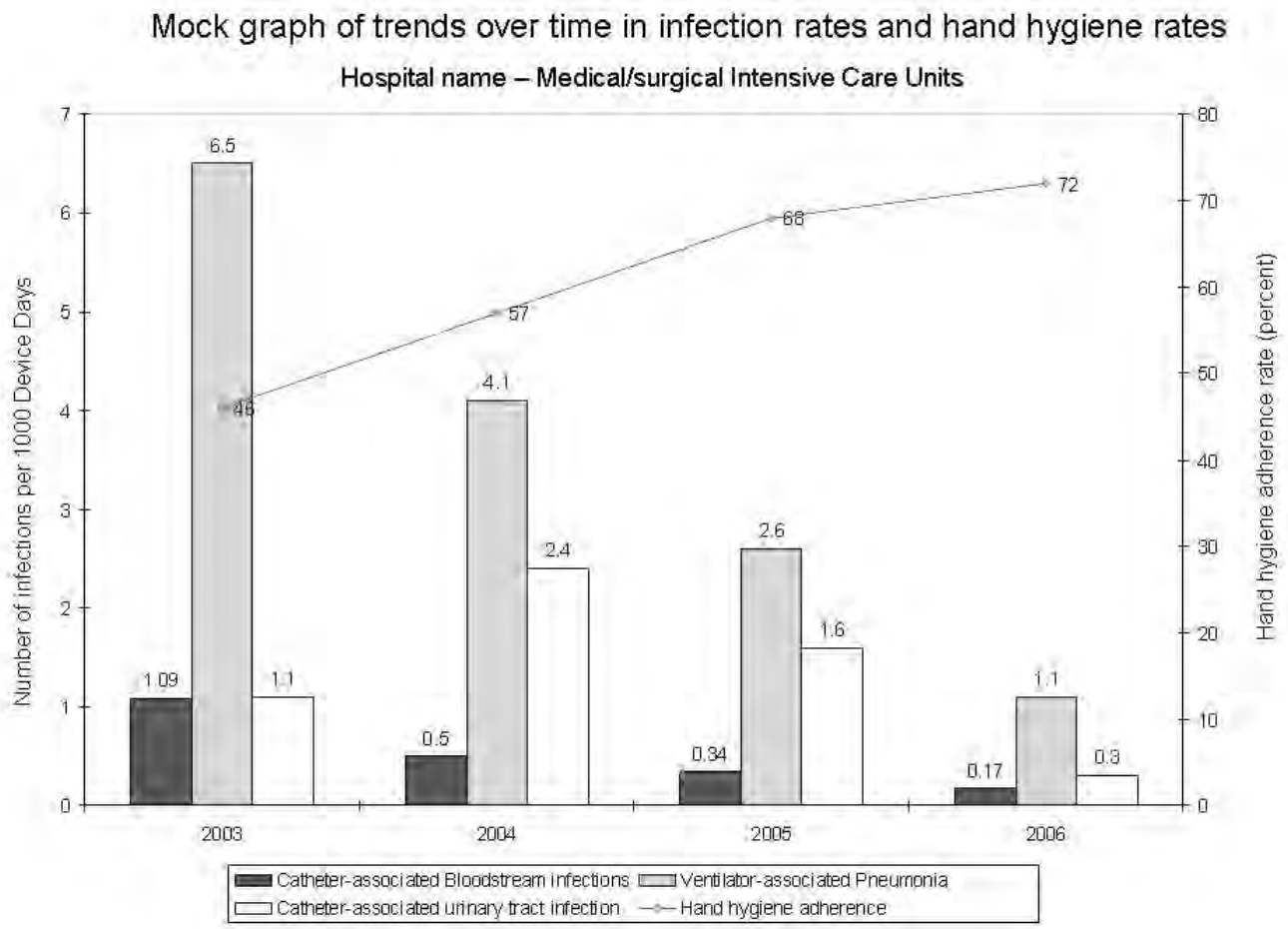
In a recent review article, Backman et al. concluded that there is a lack of rigorous evidence linking specific hand hygiene interventions with the prevention of health care–associated infection, primarily due to the limitations in studies as classified according to the Larson scoring tool.[16] They propose that different research approaches based on integrative science and mixed qualitative and quantitative methods are needed to better understand these relationships.

Several reasons why this link is difficult to establish conclusively are described in Text Box 8-4.

Text Box 8-3.

A Hospital That Correlates Health Care-Associated Infection Rates with Hand Hygiene Adherence Rates

Jewish Hospital in Cincinnati, Ohio, is a 200-bed suburban teaching hospital that implemented infection prevention care bundles in its intensive care unit in 2003. Each care bundle includes several infection prevention strategies, including hand hygiene. Since introducing care bundles, the hospital has reduced ventilator-associated pneumonia, catheter-associated bloodstream infections, and catheter-associated urinary tract infections. The hospital has also recorded trends in its hand hygiene observational data over the same period of time. The trend has been an inverse correlation between health care–associated infections, which have decreased over time, and hand hygiene adherence, which has increased over the same time period (see the following mock graph of how this might look).



Text Box 8-4.

Challenges to Linking Hand Hygiene Practices and Health Care–Associated Infection Rates

- Large sample sizes are needed to have enough infections for sufficient power to detect a change in infection rates.[10]

- Infection rates demonstrate a great deal of natural variability, and it is difficult to determine whether decreases in rates are due to random chance or natural variability rather than to the intervention.[16]

- There are limitations in the study designs used to investigate the link between hand hygiene and infection rates. Most studies are uncontrolled, pre- and post-intervention in single sites. For obvious ethical reasons, it is not feasible to conduct a randomized controlled trial in which patients would receive care from clinicians who did not perform hand hygiene.[10]

- Outcomes such as infection rates are affected by numerous additional factors, including patient age and comorbidities, number and types of procedures experienced, organizational factors such as staffing levels, staff training, and experience, and so on.

- It is difficult to separate the influence of improved hand hygiene from other factors or interventions designed to reduce health care–associated infections that are implemented during the same time frame.[10] Often hand hygiene is included in intervention "bundles" that address several aspects of care processes. For example, the Institute for Healthcare Improvement (IHI) includes hand hygiene in its bundle related to central line infections. The IHI's central line bundle has five key components: hand hygiene, maximal barrier precautions, chlorhexidine skin antisepsis, optimal catheter site selection, and daily review of line necessity (see http://www.ihi.org/nr/rdonlyres/0ad706aa-0e76-457b-a4b0-78c31a5172d8/0/centrallineinfectionshowtoguide.doc).

- The limitations of accurately measuring hand hygiene adherence using observation or product measurement (described in previous chapters) make it difficult to establish causation. Measurement methods have inherent biases that routinely lead to over- or underestimates of adherence.[10]

- Some infection rates are more likely than others to be sensitive to changes in hand hygiene. For example, bloodstream infections and urinary tract infections are associated with invasive devices that are inserted by staff and manipulated periodically while the line or catheter is in place. Surgical site infections may be less sensitive to the care process because they are more likely to be associated with practices in the surgical suite.[17] (Larson, et al. 2007).

- Some infections may be due to endogenous flora (normal and abnormal flora that are carried by the patient upon admission to the intensive care unit) rather than exogenous flora (microorganisms introduced into patients from the intensive care unit environment), which is less affected by hand hygiene.[18,19]

Key Points, Chapter 8

- Displaying adherence rates stratified by groups (units, health care worker discipline, observed opportunity, and so on) makes findings easier to interpret and use.
- Using dashboards and data displays can help effectively communicate adherence to health care workers as well as administrators and board members.
- Data trends over time are useful for demonstrating ongoing improvements in adherence.
- Infection rates often decrease with improved hand hygiene, but causation is difficult to establish.

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Appendix 8-1.

Examples of Studies That Examine the Association Between Hand Hygiene Performance and Infection Rates

Study	Setting	Methods	Findings and comments
Rupp M.E., et al.: Prospective, controlled, cross-over trial of alcohol-based hand gel in critical care units. Infect Control Hosp Epidemiol 29:8–15, Jan. 2008.	Two 12-bed medical intensive care units (MICUs) at a single hospital in Nebraska.	Two-year prospective controlled crossover trial of alcohol-based hand rub (ABHR) gel.	Significant improvement in hand hygiene (HH) adherence was not associated with detectable changes in health care–associated infection (HAI) incidence.
Eckmanns T., et al.: Hand rub consumption and hand hygiene compliance are not indicators of pathogen transmission in intensive care units. J Hosp Infect 63:406–411, Aug. 2006.	Five intensive care units (ICUs) at two university hospitals in Europe.	Primary outcome was incidence of transmission of 10 most frequent pathogens using "gold standard" genotyping methods; observed HH adherence, and measured product consumption; 18 months.	Researchers found an increase in HH adherence over time, but there was no correlation between transmission rates of health care–associated pathogens, hand rub consumption, or observed HH adherence.

Appendix 8-1. (continued)

Study	Setting	Methods	Findings and comments
Larson E.L., et al.: An organizational climate intervention associated with increased handwashing and decreased nosocomial infections. Behav Med 26:14–22, Spring 2000.	Four ICUs within two hospitals in the Mid-Atlantic region of the United States.	Eight-month quasi-experimental intervention trial to assess the impact of an intervention to change organizational culture on frequency of hand hygiene and HAIs, methicillin-resistant Staphylococcus aureus (MRSA), and vancomycin-resistant enterococci (VRE).	Researchers found 85% relative reduction of VRE rate in the intervention hospital and 44% in control hospital. VRE rates decreased significantly in both hospitals but were more significant in the intervention hospital. Rates of MRSA were not significantly different between hospitals.
Pittet D., et al.: Effectiveness of a hospital-wide programme to improve compliance with hand hygiene. Lancet 356:1307–1312, Oct. 14, 2000. Errata in: Lancet 356:2196, Dec. 13–20, 2000.	One large teaching hospital in Switzerland.	Implemented a multimodal HH campaign with promotion of bedside antiseptic hand rubs. Measures included seven observation periods with > 20,000 opportunities across four years and hand rub consumption.	Researchers found significant improvement in observed HH adherence as well as consumption of ABHR, which coincided with overall HAI rate decreases from 16.9% to 9.9% and MRSA transmission rates falling from 2.16 episodes per 10,000 to 0.93 episodes.
Pessoa-Silva C.L., et al.: Reduction of health care associated infection risk in neonates by successful hand hygiene promotion. Pediatrics 120:e382–e390, Aug. 2007.	Neonatal intensive care unit (NICU) in a children's hospital in Switzerland.	18-month multifaceted education program guided by worker perceptions with performance feedback and care procedure reorganization; observation measurement with genotyping of bloodstream pathogens; also product volume measurement.	Improving HH from 42% to 55% was associated with a 60% decrease in the risk of HAI in very low birthweight newborns; a 9-month follow-up showed sustained improvement in HH.
Doebbeling B.N., et al.: Comparative efficacy of alternative hand-washing agents in reducing nosocomial infections in intensive care units. N Engl J Med 327:88–93, Jul. 9, 1992.	Three ICUs within one large teaching hospital.	Eight-month prospective multiple crossover trial.	Significantly lower rates of HAIs were noted when a chlorhexidine hand disinfection system was used than one using alcohol and soap.
Swoboda S.M., et al.: Electronic monitoring and voice prompts improve hand hygiene and decrease nosocomial infections in an intermediate care unit. Crit Care Med 32:358–363, Feb. 2004.	14-bed intermediate care unit in teaching hospital.	Electronic voice prompts as intervention when failure to perform HH; pre and post electronic monitoring sink and ABHR dispensers with entry and exit into room; education.	Improved adherence with HH was associated with nonsignificant trends (due to low statistical power) toward lower HAI rates.

Appendix 8-1. (continued)

Study	Setting	Methods	Findings and comments
Swoboda S.M., et al.: Isolation status and voice prompts improve hand hygiene. Am J Infect Control 35:470–476, Sep. 2007.	Intermediate care unit of one hospital (three isolation and six non-isolation rooms).	Prospective three-phase electronic measurement of HH rates using product measurement with automated voice message reminders.	Greater rates of HH occurred when patients were in designated isolation rooms; however, patients in isolation rooms also had higher rates of infection.
Rosenthal V.D., Guzman S., Safdar N.: Reduction in nosocomial infection with improved hand hygiene in intensive care units of a tertiary care hospital in Argentina. Am J Infect Control 33:392–397, Sep. 2005.	Two ICUs (one surgical intensive care unit and one CCU) in one hospital in Argentina.	19-month education and performance feedback intervention, with observation of HH twice each week; included efforts to promote guideline adherence for bloodstream infection and urinary tract infection.	Adherence with HH increased from 23% before interventions to 65% after. During the same period, overall HAIs in the ICUs decreased significantly, from 48 per 1,000 patient days to 28 per 1,000 patient days.
Won S.P., et al.: Handwashing program for the prevention of nosocomial infections in a neonatal intensive care unit. Infect Control Hosp Epidemiol 25:742–746, Sep. 2004.	One level III NICU in a Taiwan teaching hospital.	23-month multimodal campaign education, reminders, incentives, and feedback; covert observation.	Improved adherence with HH was associated with a significant decrease in overall rates of HAIs, particularly respiratory infections.
Lam B.C., Lee J., Lau Y.L.: Hand hygiene practices in a neonatal intensive care unit: A multimodal intervention and impact on nosocomial infection. Pediatrics 114:e565–e571, Nov. 2004.	One 12-bed NICU in a Hong Kong university hospital.	HH education and a problem-based task-oriented protocol emphasizing minimal handling and clustering of nursing care procedures; unobtrusive observer.	HH improved following an interventional period, and HAIs decreased from 11.3 to 6.2 per 1,000 patient days.
Fendler E.J., et al.: The impact of alcohol hand sanitizer use on infection rates in an extended care facility. Am J Infect Control 30:226–233, Jun. 2002.	Two units of a 375-bed extended care facility.	Alcohol gel hand sanitizer introduced, and infection rates monitored for 34 months.	A significant overall reduction in infection rates of 30% was found in units that used the hand sanitizers compared to units that did not.

chapter 9

Measurement Is Only the Beginning: Factors That Contribute to Improvement

"Sometimes, the step from best evidence to best practice is simple; however, most of the time it is not, and we need various strategies targeting obstacles to change at different levels, which could even present conflicting values for individual practitioners."[1(pg1228)]

The purpose of this chapter is to introduce the strategies and challenges associated with implementing successful interventions to improve hand hygiene practice in health care organizations. It also provides examples of the fundamental linkage between measurement and improvement activities. Sources for additional information and improvement tools are provided in Chapter 10.

Complexity of Changing Behavior

As valuable as guidelines are for identifying and recommending evidence-based practices for improving quality and reducing inappropriate variation in care, they are sometimes ineffective in directly changing behavior. For example, Larson et al.[2] studied the diffusion, implementation, and impact of the revised Centers for Disease Control and Prevention (CDC) hand hygiene guidelines[3] on practice in 40 National Nosocomial Infections Surveillance system hospitals. They found that hospital staff were well aware of the guidelines and that structural changes had been made to implement new policies and ensure that products were available to staff. However, there was no difference in the process of hand hygiene or the outcome of infection rates when comparing hospitals with high and low guideline implementation scores. The researchers concluded that dissemination of the guidelines was insufficient to effect change in clinician practice. To improve hand hygiene adherence, a comprehensive, multidisciplinary effort that includes explicit support from administration is needed.

Effective Models and Strategies for Hand Hygiene Behavior Change

Many have had the experience of implementing new programs or systems to improve hand hygiene, only to find little change in adherence rates or improvements that were not sustained when the focused attention on hand hygiene was removed. In part, this is because the science of quality improvement is not sufficiently developed to establish which interventions work best under what specific circumstances and settings.[1] As Grol and Grimshaw point out, there are many different, and sometimes competing, approaches to changing practice, all of which claim to be effective.[1]

Experts suggest that interventions often fail to improve staff practice because they are not customized to specific problem areas within an organization. Sometimes interventions that work well in one organization will not work well in other organizations. This variation highlights the need to thoroughly investigate the underlying causes of the problem as well as identify local obstacles to improvement. Then you can tailor your improvement intervention to your facility or special setting-specific needs.

Before implementing improvement strategies, it is useful to explicitly consider why and how a particular strategy should work.[4] Implementing change often starts with a conceptual framework based on a theoretical model for

behavior change.[5] A widely used theoretical model for explaining motivation to perform hand hygiene is the Theory of Planned Behavior.[6–8] This theory postulates that one can predict an individual's intention to perform a behavior by that person's attitude and beliefs, perception of social pressure to perform the behavior (subjective norm), and perceived level of control (ease or difficulty) in performing that behavior.[9] Whitby et al. applied the Theory of Planned Behavior in a study of 754 nurses.[10] They found that hand hygiene behavior fell into two broad categories: inherent, which is an intrinsic self-protective behavior that occurs when hands are visibly soiled or sticky, and elective behavior, which is driven more by social norms, such as handwashing before eating and before patient care or contact with the environment. Whitby et al. argue that efforts to increase elective hand hygiene behavior through structural interventions such as improving access to hand rub will have limited success without a concomitant behavioral modification component.

Grol and Grimshaw, in their review of the effectiveness of strategies for changing behavior, describe several different behavior change theories that are applicable to improving hand hygiene (Table 9.1).[1] Maskerine and Loeb suggest that the approach based on the health belief model and the theory of reasoned action, along with behavioral reinforcement, may be the most likely to succeed.[11] Ideally, the behavior change model should be explicitly stated because it drives the selection of improvement strategies and allows others to make informed choices about what works best in different settings.[12,13]

Factors That Affect the Success of Improvement Initiatives

Many internal and external factors influence the success of a hand hygiene improvement initiative. These factors can be grouped into five categories:

- Use of effective strategies
- Organizational and system characteristics

Table 9-1.
Examples of Theoretical Models and Improvement Strategies for Behavior Change in Hand Hygiene

Theoretical Model	Explanation for Low Adherence	Strategies for Improvement Associated with the Model
Cognitive	Lack of knowledge of the results of poor hygiene and the evidence base	Education; solutions identified through discussion of barriers
Behavioral	Behavior is mainly influenced by external stimuli; more are needed to change behavior	Reminders, feedback, incentives, modeling, and external reinforcement
Social Influence	Absence of social norms promoting hand hygiene; lack of leadership	Local consensus, opinion leaders, role models setting examples
Marketing	Important to have clear and attractive message tailored to target audience	Mass media campaigns, academic detailing
Organizational	Problem is system failure not individual practitioner	Quality improvement teams, redesign processes, workload, promoting safety-oriented culture

Source: *Adapted from Grol R., Grimshaw J.: From best evidence to best practice: Effective implementation of change in patients' care. Lancet 362:1225–1230, 2003.*

- Personnel
- Involvement of patients and families
- External environment

These factors and their underlying components are displayed in Figure 9-1 and are discussed in detail throughout the rest of this chapter.

Before you implement change, you should ensure that you have an accurate assessment of your current state of hand hygiene practice. As stated in Ontario's *A Quick Guide to Just Clean Your Hands*, "Good data can close the gap between perception and practice."[14(p. 4)] Much as a physician diagnoses a patient, you need to be reasonably confident about what the problem is before you decide on a treatment. Accurate assessment can minimize both the risk of falsely concluding that there is no problem when there really is one and unnecessarily tampering with processes that are actually performing well.

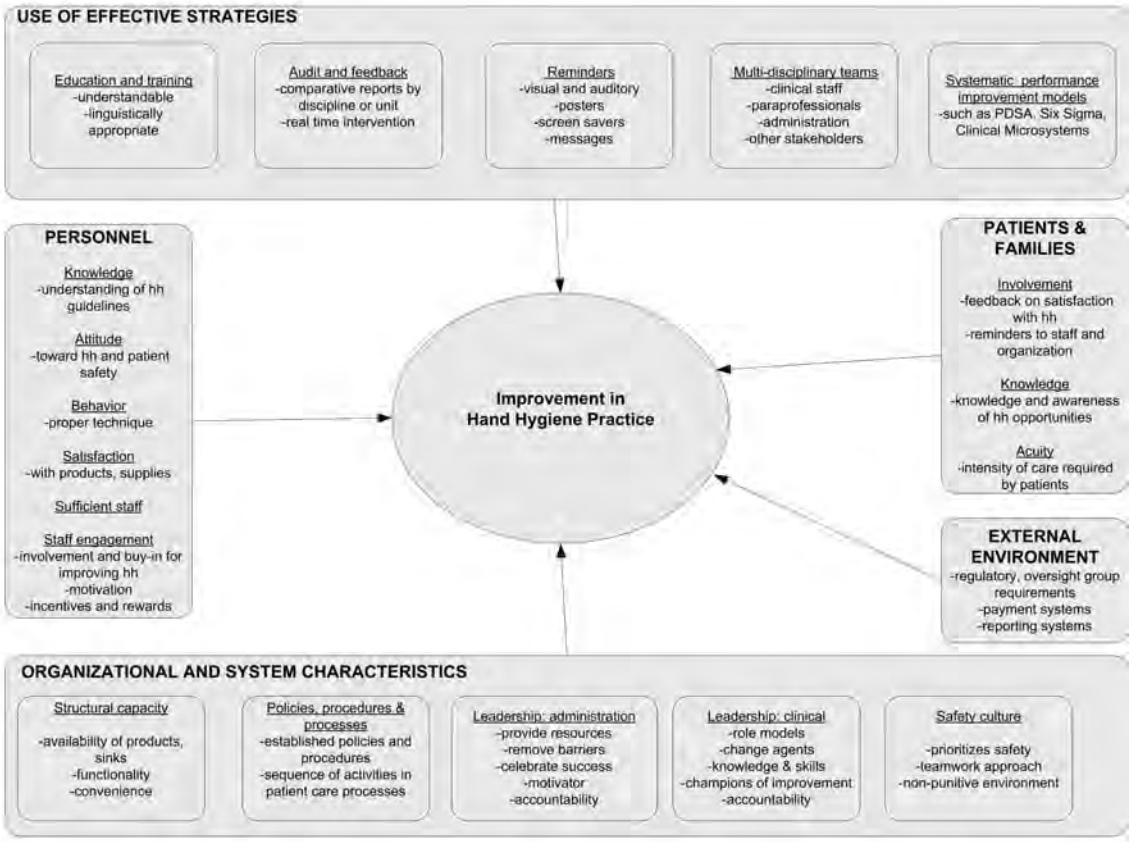
Use of Effective Strategies

It is important to select and implement effective interventions. The following are five examples of widely used intervention strategies for hand hygiene initiatives:

- Education and training
- Audit and feedback
- Reminders
- Use of multidisciplinary teams
- Systematic performance improvement methods

Figure 9-1.

Factors Affecting the Success of Hand Hygiene Improvement Initiatives*



** hh, hand hygiene.*

Education and Training

Researchers have found that many health care workers do not have a clear understanding of the opportunities for hand hygiene.[14–16] While most staff believe that they are sufficiently knowledgeable about hand hygiene, training staff on the specific indications for hand hygiene can increase their awareness of the complexity of the indications and make them more sensitive to non-adherence.

Because you may have a wide range of intended audiences, the level and amount of education and training that you provide should be tailored to each audience. Education and training should be easy to understand, culturally appropriate, and conducted in languages other than English, as necessary.

Audit and Feedback

Systematic literature reviews have shown that audits (also known as periodic performance measurement) followed by comparative feedback on performance, are generally effective for stimulating improvement at both the provider and organizational levels, particularly when baseline levels of performance are low.[17,18] The WHO guidelines consider audit and feedback of adherence data to be an essential element of multimodal strategies to improve hand hygiene practice.[19,20] Feedback can be unit specific, practitioner specific, or both, and it can be reported confidentially or publicly.

Numerous studies have demonstrated improvement in adherence rates after audit and feedback. However, one study found that the influence of live observers had a greater impact on hand-washing behavior than sustained feedback of unit-level adherence rates.[21]

Reminders

Visual or auditory reminders are popular and effective strategies for improvement. Grol and Grimshaw reviewed the literature for interventions focused on improving hand hygiene and found that reminders had a modest but sustained impact on hand hygiene practices in the seven studies.[1] Examples of reminders include posters and brightly colored signs, eye-catching screen savers, e-mail messages, voice mail messages, labels on equipment and supplies (including patient gowns), campaign buttons, and "talking walls."[22]

Ontario's "Just Clean Your Hands" program encourages the use of reminders; "the visuals are designed to support and maintain healthcare providers' awareness of hand hygiene issues, as well as the importance of adherence. Posters and other support materials in a consistent visual style are valuable ways of supporting and reinforcing key messages and behavior change when used as part of a multifaceted strategy."[23] Samples of their "reminders" can be found at http://www.justcleanyourhands.ca/reminders_in_the_workplace.php. Using multiple reminders and changing signs periodically helps to maintain attention to hand hygiene.

Use of Multidisciplinary Teams

Most systematic quality improvement models recommend using multidisciplinary teams to analyze and improve hand hygiene processes. The Institute for Healthcare Improvement (IHI) recommends that improvement teams be "heterogeneous in make-up but unified in mindset."[24] It is important to include all stakeholders in the process to gain buy-in and cooperation. Each member of the care team should have a stake in the outcome, and all the members should work together to achieve the common goal.[24] The IHI recommends that, at a minimum, such a team should include an administrator or a senior leader who can help remove barriers to implementation and someone from the department that supplies hand hygiene agents to clinical areas. The team should comprise individuals who want to be on the team rather than those who do not, and the team should also include clinical champions and opinion leaders within the organization to enhance the credibility of the improvement effort.

The CDC and WHO hand hygiene guidelines also recommend use of a multidisciplinary program to improve adherence.[3,19] Nevertheless, there is evidence that the team approach is not being used as often as it should be. Larson et al. found that fewer than 20 of 40 National Nosocomial Infection Surveillance System hospitals had actually implemented multidisciplinary programs for improving hand hygiene.[7]

Systematic Performance Improvement Methods

Use of a systematic quality improvement model adds structure and rigor to your improvement efforts. Common elements of most structured approaches include the following:

- Establishing goals
- Measuring performance
- Investigating causes and contributing factors
- Analyzing current processes using a team approach
- Implementing changes using a gradual, staged approach
- Evaluating the short- and long-term impact of interventions

Well-known examples of sustained, structured quality improvement models include the following:

- The plan-do-study-act (PDSA) rapid cycle improvement (for additional information see http://www.ihi.org/IHI/Topics/Improvement/ImprovementMethods/HowToImprove/)
- Six Sigma[25–27]
- Clinical Microsystems[28]

Many of the tools incorporated in structured quality improvement models are useful for understanding reasons for non-adherence to guidelines and identifying and prioritizing strategies for improvement. Examples of these tools include fishbone, or Ishikawa, diagrams; flowcharting of processes; multivoting and nominal group techniques; and statistical process control charts.

Text Box 9-1 provides two examples of organizations that used systematic approaches to improve health care worker hand hygiene adherence.

Other Strategies

In addition to the systematic approaches described so far, some less-well-known improvement strategies may be effective in improving hand hygiene. These include the use of local opinion leaders, academic detailing, and positive deviance. Local opinion leaders are persons considered by their colleagues or peers to be educationally influential in influencing behavior or implementing change.[30] They are distinct from role models in that they need not come from the same discipline or provider group. Academic detailing, also known as educational outreach visits, involves using a trained person to meet with providers in their practice settings to give information, with the intent of changing the provider's practice.[30,31]

Positive deviance is a culturally appropriate improvement approach based on the notion that in every community, there are certain individuals (the "positive deviants") whose special practices/strategies/behaviors enable them to find better solutions to prevalent community problems than their neighbors who have access to the same resources.[32] Gawande describes the successful use of positive deviance for reducing infection rates in a VA hospital in Pittsburgh. In brief, staff from a wide variety of disciplines and levels were systematically engaged in identifying and applying creative approaches to preventing infection, which led to a dramatic reduction in methicillin-resistant *Staphylococcus aureus* (MRSA) transmission rates over time.[33]

Organizational and System Characteristics

In order to put into place structures and processes that facilitate hand hygiene, it is necessary to understand the organizational systems and environment in which health care providers work.

Structural Capacity

The organization should provide easy, convenient access to hand hygiene products, gloves, lotions, sinks, and the like and should ensure that staff are satisfied with the products used.[19] Many initiatives have found that putting supplies such as alcohol-based hand rub at the point of care improves hand hygiene. According to Ontario's *A Quick Guide to Just Clean Your Hands*, point of care means that three elements are present simultaneously: the patient, the health care provider, and care that involves patient contact.[14]

Policies, Procedures, and Processes

Organizations should have written policies and procedures in place that describe when and how staff are expected to perform hand hygiene and how staff are to be educated and

Text Box 9-1.

Using Systematic Approaches for Improving Hand Hygiene

Managing Toward Daily Compliance

The Cleveland Clinic in Cleveland, Ohio, launched an initiative to improve hand hygiene that began in the oncology unit in June 2007. The goal was to increase hand hygiene adherence from the baseline rate of 24% to a sustained rate of greater than 85%.

Demonstrating that short-term data collection and rapid feedback can have a big impact on hand hygiene performance, staff introduced the "Managing Toward Daily Compliance" methodology, a quick-cycle method of observing practices and reacting to successes and non-adherence. The objective of "Managing Toward Daily Compliance" is daily management of all groups of health care workers toward adherence to standard operating procedures, and it is accomplished through a multidisciplinary team on a selected unit.

Staff use a rapid-cycle approach from the Institute for Healthcare Improvement (IHI) along with strategies and tools from Six Sigma in their improvement efforts. They launched an awareness campaign that includes health care worker education, chief executive officer messages, and placement of alcohol-based hand rub dispensers inside and outside patient rooms. The team is led by the unit's nurse manager, and team members include nurses, medical staff members, and staff from radiology, food services, environmental services, patient transportation, phlebotomy, and respiratory therapy.

Each team member observes at least five episodes of hand hygiene daily, and meets briefly ("huddles") with other team members the following day to share results; results are recorded on a board, with the names of the observed individuals included, if available. Each team member provides feedback to his or her respective area. When staff reach their adherence goal and sustain it for at least one week, the frequency of huddles decreases. However, anytime adherence falls below 85%, daily huddles resume. Adherence increased to 94% within five weeks of implementing the "Managing Toward Daily Compliance" initiative, with an average of 180 observations collected by the team each week. Ongoing adherence has remained above 85%, and the project has been expanded to four additional units with similar success.

Source: Weber MM, et al.: *Using Managing Towards Daily Compliance Methodology as a Pilot to Improve Hand Hygiene on an Oncology Nursing Unit*. Society for Healthcare Epidemiology of America annual meeting, Orlando, FL, April, 2008.

Using Six Sigma Methods

The Six Sigma process was an effective strategy for organizing knowledge, opinions, and actions to improve staff adherence to the Centers for Disease Control and Prevention (CDC) hand hygiene guidelines in four intensive care units at three Department of Veterans Affairs (VA) medical centers, according to Eldridge et al.[29] Beginning in 2003, they systematically applied the five phases of Six Sigma known as DMAIC (Define, Measure, Analyze, Improve, Control). In the Define (D) phase, they developed a project charter agreed upon by all participants. In the Measure (M) phase, they developed a process map, used a cause-and-effect matrix, and measured baseline performance by observation and by tracking grams of alcohol-based hand rub used. They also measured intensive care unit (ICU) staff attitudes and perceptions and conducted a hand assessment. In the Analyze (A) phase, they utilized failure mode and effects analysis and analyzed performance data. The Improve (I) phase involved adjusting processes, and the Control phase (C) involved remeasurement to determine whether gains were sustained. The success was demonstrated by the fact that the observed hand hygiene adherence rate went from 47% to 80% by late 2004, based on analysis of more than 4,000 observations. The rate of use of alcohol-based hand rub product (expressed in grams per patient day) also increased demonstrably in the three different ICUs that were able to measure this parameter.

trained. Policies should be developed by a multidisciplinary team that includes the organization's leadership, safety personnel, environmental services staff, and staff from various departments, and should be widely disseminated across the organization.

To reduce the number of hand hygiene opportunities within an episode of care, some organizations have begun to examine ways to simplify their care processes. For example, an effort to minimize handling and to cluster nursing procedures in a neonatal intensive care unit (NICU) reduced the total number of patient contact episodes from 2.8 per patient per hour to 1.8 per patient per hour.[34] When this effort was combined with improved access to alcohol-based hand rub, audit, and feedback, the NICU observed a substantial decrease in health care–associated infection rates.

Leadership

With most improvement initiatives, the commitment of an organization's leadership is one of the factors that ultimately has the greatest impact on success. Leadership should be defined broadly to include not only the organization's executives, officers, and directors but also the clinical staff leaders in each area and the leaders of teams and improvement initiatives. Larson reports that senior management commitment to administrative and system change is essential to achieving and sustaining reductions in infection rates.[35] Rosenthal et al. also found that administrative support played an important role in the improvement of hand hygiene adherence.[36]

Administration Leaders

Administration determines resources available for hand hygiene measurement and improvement, including adequate infection prevention and control staff, resources for education, and the like. In addition, administration leaders do the following:

- Set expectations for the staff and for the board (for example, by determining organizational priorities and the level of the organization's focus on hand hygiene)
- Motivate staff through leading by example both in performing hand hygiene and by participating in performance improvement initiatives (see Text Box 9-2 for an example of visible commitment)
- Remove structural barriers (for example, by providing for the installation of dispensers and the purchase of individual bottles of alcohol-based hand rub to eliminate problems associated with inconvenient access to products)
- Establish accountability (as described later in this chapter)
- Celebrate successes throughout the organization and within departments

Clinical Leaders: The Importance of Role Models

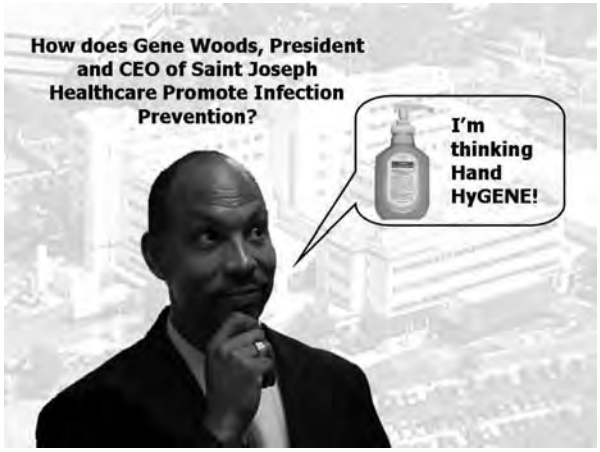
Research in many areas of health care has found that if role models don't demonstrate the preferred behavior, others will not either. Lankford et al. assessed the effect of medical staff role models on hand hygiene practice and found that health care workers in a room with a higher-ranking medical staff member or peer who did not wash hands were significantly less inclined to wash their own hands.[37] Snow et al. studied student nursing assistants to determine the effect of hand hygiene practices on students during clinical rotations and found the mentor's hand hygiene practices to be the strongest predictor of student hand hygiene.[38] Pittet and Boyce noted in their review of the literature that a lack of role modeling from superiors or peers was a barrier to appropriate hand hygiene.[16] In the United Kingdom, junior doctors have been noted to wash their hands more often when consultants set the example in performing hand hygiene.[39]

According to the Ontario's *A Quick Guide to Just Clean Your Hands*, "Leadership and hospital-wide commitment to

Text Box 9-2.

An Example of Visible Commitment

St. Joseph Hospital in Lexington, Kentucky, has an executive team that conducts patient rounds once per quarter, during which the team members use scripted questions to ask patients about the hand hygiene practices of health care workers. The executive team also observes staff to make sure they are practicing hand hygiene when they should. Results of the executive rounds are communicated to leaders for staff commendations and notification of opportunities for improvement. The hospital uses the following poster, showing a picture of the chief executive officer, to encourage hand hygiene.



hand hygiene—with visible role models—is key to success."[14(p. 3)] Pittet and colleagues undertook a study of factors associated with hand hygiene non-adherence among physicians; they found that adherence was associated with the belief of being a role model for other colleagues as well as the awareness of being observed, easy access to cleansing solutions, and a positive attitude toward hand hygiene.[40]

Accountability

Chronically non-adherent staff may need oversight, with possible disciplinary action, to motivate changes in behavior. Some organizations hold managers and staff directly accountable for hand hygiene performance and tie performance to merit increases. Text Box 9-3 provides examples of organizations that have processes in place to address hand hygiene adherence.

Leaders of the Improvement Initiative

Leaders of the hand hygiene improvement initiative should have the requisite knowledge, training, and skills to increase the likelihood of success. This includes familiarity with performance improvement tools as well as strong organizational and interpersonal skills. It may be helpful to designate one person to be accountable for implementing change and to give that person authority across disciplines, including physicians, and to provide that person with the resources needed to improve hand hygiene performance.

Safety Culture

Safety culture and *culture of safety* refer to an organization's commitment to safety that is evident at all levels and that permeates the entire organization, from frontline personnel to executive management. Characteristics of organizations with a safety culture have been identified in studies of health care organizations[42–44] and in fields outside health care with exemplary performance with respect to safety.[45,46] Some of these characteristics include the following:

- Acknowledgment of the high-risk, error-prone nature of an organization's activities
- A blame-free environment where individuals are able to report errors or near misses without fear of reprimand or punishment
- An expectation of collaboration across ranks to seek solutions to vulnerabilities
- A willingness on the part of the organization to direct resources for addressing safety concerns[47]

To improve hand hygiene performance, it is particularly important to promote a culture that empowers staff to speak up when non-adherence is observed. While changing organizational culture can take years, culture is not necessarily homogenous throughout the organization. It should be possible to demonstrate measurable changes in culture within specific departments or units over time. In a recent multicenter trial, Sinkowitz-Cochran et al. found that perceptions of organizational culture were strongly associated with perceptions of the benefit of hand hygiene and actual hand hygiene practices.[48]

Leaders must establish a safety-oriented culture, and it is possible to target hand hygiene interventions toward leadership to promote culture change. Larson et al. studied the effectiveness of an intervention to change organizational culture on the frequency of staff hand washing and infection rates.[49] Top management and medical and nursing leaders were enlisted to provide active support for culture change and to engage the implementation managers in the development of specific elements of the intervention. In comparison to the control hospital, the intervention site experienced a significant and sustained increase in the frequency of hand washing, with a concomitant reduction in rates of vancomycin-resistant enterococci (VRE) and MRSA.

Personnel

Do you and your team understand which personnel have direct contact with the patient or the environment across the organization? Do staff demonstrate proper hand hygiene technique? Do staff believe that hand hygiene adherence is important for reducing infections? When do staff think they should wash their hands? Are people dissatisfied with the choice of alcohol-based hand rub or lotion, and do they resist using it? As Chapter 5 notes, there are a variety of surveys to assess staff knowledge about hand hygiene guidelines, staff attitudes toward

Text Box 9-3.

Accountability of Staff for Hand Hygiene Performance

The multihospital Moses Cone Health System is headquartered in Greensboro, North Carolina. When the usual hand hygiene promotional efforts (staff education about hand hygiene, posters, increased availability of alcohol-based hand rub, and so on) did not improve hand hygiene adherence rates from the usual 35% to 40%, Moses Cone created a program in which individuals who do not perform proper hand hygiene receive "tickets." A copy of the ticket is sent to the person's director, manager, or department head, and another copy is sent to the infection prevention department. Additional education is provided with each ticket, and consequences increase (for example, verbal warnings, written warnings, letters from the peer review committee, culminating in possible termination after five tickets). All physicians, clinical staff, nonclinical staff, and even contracted staff and volunteers are included in the program. This process, together with several other improvement strategies, resulted in a drop in the number of methicillin-resistant *Staphylococcus aureus* (MRSA) infections from 9 per 1,000 patient days to 0.49 per 1,000 patient days.[41]

Greenview Regional Hospital in Bowling Green, Kentucky, is a 211-bed hospital that experienced a MRSA outbreak that began in 2002 and continued into 2003, despite standard infection control interventions and education; additional outbreaks occurred in 2004. When direct observation of hand hygiene practices among hospital staff and physicians revealed poor hand hygiene adherence (less than 5% across all staff and physicians), the hospital's infection preventionist began doing 10- to 15-minute direct observations among all patient care departments and shifts, with reporting of monthly adherence rates.

Non-adherent health care workers were identified and verbally informed when appropriate and reasonable; non-adherence was also reported to nursing/department managers. Managers were required to complete action plans for non-adherence, and these plans were to be sent to human resources. Hospital administration was informed if managers did not complete action plans. Standard human resources and hospital policies were followed for those who continued to be non-adherent.

Non-adherent physicians were observed without initial verbal intervention and were allowed three observations of non-adherence every six months. Physicians reaching the third observed episode of non-adherence were given a series of letters: the first to the physician directly; the second to the physician and to his or her department chair; and the third to the physician, the department chair, and the credentials committee. Further action with regard to any continued physician non-adherence was the responsibility of the credentials or executive committee, according to the medical staff by-laws.

By 2005, hand hygiene had improved from the 2003–2004 baseline of 4% among health care workers to 85% and from 2% among medical staff members to 95%. The organization's MRSA outbreaks resolved as a result of the accountability for hand hygiene and ownership of this process, from nursing mangers, administration, and medical staff leadership.

hand hygiene, and staff satisfaction with products. Experts find that improvement works best when staff are ready for it.[5]

Staff Engagement

It is important to directly engage staff in a hand hygiene improvement initiative. Rather than dictate changes in behavior, you should have staff identify obstacles and solutions. Convene focus groups before and during interventions to identify obstacles to adherence. This type of staff engagement can be helpful in identifying remediable factors, obtaining staff buy-in, and improving adherence rates.

Incentives and Rewards

One way to engage staff in performance improvement is to use incentives and rewards. Text Box 9-4 presents examples from three organizations that have developed creative ways to motivate staff.

Involvement of Patients and Families

Through the "Partners in Your Care" program, many organizations have educated and engaged patients and families to remind staff to wash their hands.[50–53] Patient empowerment is being evaluated in a variety of countries as part of the WHO initiative (described in Chapter 7) using Web-based

surveys. Preliminary results indicate that patient involvement may be a useful adjunct to other improvement activities.[54]

A potential modification to the England and Wales "cleanyourhands" campaign[55] (as described in Chapter 7), which involves giving patients a bottle of alcohol-based hand rub to use as a prompt for health care workers, is being evaluated as part of the "It's OK to Ask" feasibility study. The eight-week study involved talking with infection control teams at each of five participating trusts and conducting surveys with inpatients and members of the public within each trust.

Patients and visitors appreciate knowing that a health care setting emphasizes hand hygiene. There is evidence that patients become more confident about the care they receive when they see that the organization has a commitment to good hand hygiene.[14] As explained in Chapter 5, you might want to consider monitoring patient satisfaction with hand hygiene, especially in patient populations capable of responding to surveys, such as the outpatient setting.

Because patients and families frequently do not have a clear understanding of the opportunities for hand hygiene, education is often needed. Text Box 9-5 contains examples of how patients and families can be educated regarding hand hygiene.

Several of the resources and toolkits described in Chapter 10 include educational materials targeted to patients.

It is important to note that involving patients is not the same as relying on patients to change provider behavior. You should be careful to avoid shifting the burden for monitoring and improvement to those who are sick and vulnerable. Asking patients to remind staff about performing hand hygiene has been criticized by some experts, who argue that hand hygiene is a fundamental ethical responsibility of all health care workers.[56,57] These experts also suggest that patients should not be expected to confront health care workers about non-adherence because they could be subject to retaliation. Pittet and Perneger point out that hand hygiene is required in many situations aside from "before patient contact," that hand hygiene adherence is generally worse among physicians than among other care providers, and that patients may feel too intimidated by physicians to ask them whether they've washed their hands.[58] In addition, health care workers may not be receptive to being reminded by patients to perform hand hygiene. If you decide to engage patients in your hand hygiene improvement efforts, consider involving them in a way that clearly avoids transferring responsibility from health care workers to patients or visitors.[14]

External Environment

Groups external to a health care organization often add increased demands for infection prevention that directly and indirectly affect hand hygiene adherence. Though external demands often increase workload, they can facilitate local improvement by capturing leaders' attention and potentially adding resources and measurement systems. The following examples of external initiatives support increased focus on hand hygiene.

Consumer groups demand, and many states and countries require, public reporting of health care–associated infections, including catheter-associated bloodstream infections and urinary tract infections.[59] Medicare and other insurers have begun to prohibit payment for hospital-acquired conditions, including selected health care–associated infections.[60] Accrediting bodies such as The Joint Commission and the National Committee for Quality Assurance require compliance with hand hygiene guidelines and reporting of indicators related to infection prevention. State inspections for licensure and federal Medicare and Medicaid certification include assessment of infection prevention activities. These and other initiatives put pressure on health care organization leadership to ensure that hand hygiene is being performed effectively.

What is Success?

Defining specific, measurable goals for improvement is an integral part of most structured approaches. Yet, without a national benchmark, it is difficult to know what an appropriate goal is. The Ontario "Just Clean Your Hands" initiative defines success as "a steady improvement in compliance rates."[14(p. 10)] Improving hand hygiene involves changing a habit, and it takes time to obtain a sustained

Text Box 9-4.

Examples of Staff Incentives and Rewards

The Denver Health and Hospital Authority in Denver, Colorado, established a positive reinforcement program that promotes staff hand hygiene adherence. In 2007, the infection control and patient quality and safety departments, along with the department of public relations, began a new campaign to keep hand hygiene in the forefront of staff awareness. This reinforced a 2006 campaign that consisted of humorous reminders at every alcohol-based hand rub dispenser and signage encouraging patient involvement that were placed in all patient rooms and exam rooms.

Each health care worker who is "caught" performing hand hygiene before and after patient care is given a reward ticket. All health care workers who touch patients as part of their job duties are eligible. Each month's raffle ticket is a different color and is associated with a monthly prize. Eligible health care workers write their contact information on the backs of the tickets and drop them into labeled ballot boxes located throughout the patient care areas. Each month the boxes are emptied, and hospital leaders gather to preside over the drawing. The winner receives a prize such as a digital camera, a $300 gas card or gift certificate, ski passes, or athletic game tickets. In addition, the winner is highlighted in the hospital's monthly newsletter.

Spartanburg Regional Healthcare System in Spartanburg, South Carolina, uses several different approaches to encourage optimal hand hygiene by staff:

Replacing the "clinical ladder" previously in place for nurses, the organization's "Nurse Pride" program encompasses many initiatives in the hospital, including hand hygiene. Unit-based nurses, who are trained to observe staff hand hygiene performance, complete 100 observations over a 12-week period to receive "pride points," which are considered during annual performance appraisals and merit increases. In 2007 a nurse could earn up to an additional $8,000, depending on the number of points accumulated.

"Caught You Caring" forms provide staff with a mechanism to recognize other staff members in the act of providing outstanding service. Hand hygiene is one component of this incentive program, which recognizes staff members who go above and beyond in providing excellent service to other staff members or patients. The completed forms are given to an employee's manager, who considers the forms during the annual review process.

The "Safety First" incentive program rewards staff for positive behavior in relation to various aspect of patient safety, including hand hygiene. Employees receive scratch-off cards and win instant prizes and become eligible for other prizes.

Brookhaven Memorial Hospital Medical Center is a 321-bed acute care level II trauma center in Patchogue, New York. The organization has monitored hand hygiene adherence since 2001 during infection control and environment of care rounds, but the number of staff observed was originally small, usually fewer than 50 per month.

In October 2003, following the hospitalwide placement of alcohol-based hand rub dispensers, the infection control department wanted to monitor staff use of the new product. The infection control department developed a hand hygiene data collection tool and began to ask employee volunteers to anonymously observe fellow employees performing hand hygiene; each was asked to complete 10 observations per month.

The infection preventionist instructed the employees in how to complete the form when they were given the data collection tool. The observer noted the task being performed by the employee at the time of the observation, whether hand hygiene was performed, and the name of the employee.

The observed employee received a "congratulations" letter or a "friendly reminder" letter. As an incentive for conducting the observations and completing the data collection form, each employee received two movie tickets when he or she submitted the completed form to the infection control department. Observations have increased from fewer than 50 per month to about 100 per month. Hand hygiene adherence rates, which have steadily improved since the employee observation process began, are reported to administration, department heads, and the infection control committee. Staff receive feedback from department managers.

Text Box 9-5.

Educating Patients and Families

St. Joseph Medical Center in Bloomington, Illinois, part of OSF Healthcare System, implemented GetWellNetwork, a patient-centered technology that patients can access through their television to view educational materials, hospital services, and entertainment options. The educational offerings include a segment on hand hygiene for patients.

Spartanburg Regional Healthcare System in Spartanburg, South Carolina, posts small signs for patients and visitors that say "Help us prevent the spread of germs. Before touching clean supplies, food or drinks, please wash your hands or use alcohol rub."

In June 2008, the CDC launched the patient admission video "Hand Hygiene Saves Lives," which teaches patients and visitors the importance of hand hygiene and encourages them to remind health care workers to practice hand hygiene. The video is available for download at no charge at http://www.cdc.gov/handhygiene/Patient_Admission_Video.html.

improvement.[61] Based on the experience of many in the field, it often takes a long time to see the impact of improved hand hygiene, particularly when the goal is to incur long-term changes in behavior rather than short-term responses to interventions that are frequently unsustained. Some researchers have suggested that it may be unrealistic to expect hospitals to sustain adherence rates of 90% to 100%, and they have questioned whether full adherence to hand hygiene guidelines is a reasonable expectation.[62] For example, Earl et al. found that even when alcohol-based hand rub was provided in two intensive care units, hand hygiene adherence rates improved but remained below 60%.[63]

Nevertheless, with consistent monitoring, organizations should be able to demonstrate significant improvements in hand hygiene adherence over time. By using multiple measurement approaches, organizations can also demonstrate increased structural capacity for hand hygiene, as well as awareness of the importance of hand hygiene and changes in attitudes among staff and patients.[14] The ultimate goal is to be able to demonstrate sustained improvement over time.

Key Points, Chapter 9

- The effectiveness of a quality improvement effort in hand hygiene is affected by many things, including leadership, intervention approaches, organizational factors, personnel and patient characteristics, and the external environment.
- Top-down leadership support is critical to success with improving hand hygiene adherence.
- Improvement efforts should be tailored based on targeted measurement and knowledge of culture and setting; the same interventions may not fit all areas.
- Several strategies have been shown to be effective in enhancing hand hygiene practices, including education, feedback, reminders, and structured performance improvement approaches.

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chapter 10

Resources for Measurement and Improvement

Resources from Organizations Collaborating in Monograph Development

Six leading organizations in the area of infection control and infectious diseases collaborated on this monograph to identify promising approaches to monitoring hand hygiene performance in health care organizations. A brief overview of these collaborating organizations and their available resources for measuring and improving hand hygiene are presented here:

Association for Professionals in Infection Control and Epidemiology, Inc.

The mission of the Association for Professionals in Infection Control and Epidemiology, Inc. (APIC) is to improve health and patient safety by reducing risks of infection and other adverse outcomes. APIC, a nonprofit, international organization founded in 1972, is located in Washington, DC, and provides its nearly 12,000 members with resources such as educational tools and annual educational conferences, practice guidance, and extensive resource materials available on its Web site (http://www.apic.org). APIC advances its mission through research, collaboration, public policy, practice guidance, and credentialing. APIC seeks to influence and improve the practice and management of infection prevention and control and recognizes the central role hand hygiene plays in infection prevention. APIC debuted the patient safety DVD "Hand Hygiene Saves Lives" at its annual conference in Denver, Colorado, June 15 through 19, 2008. APIC was also a member of the hand hygiene task force that developed the Centers for Disease Control and Prevention's (CDC's) 2002 "Guideline for Hand Hygiene in Health-Care Settings" and the Institute for Healthcare Improvement (IHI) panel that developed the *How-to Guide: Improving Hand Hygiene*.

Centers for Disease Control and Prevention

The CDC, located in Atlanta, Georgia, and one of the major operating components of the U.S. Department of Health and Human Services, seeks to promote health and quality of life by preventing and controlling disease, injury, and disability by working with partners throughout the nation and the world. A recognized leader in the development of health care guidance documents, the CDC's Healthcare Infection Control Practices Advisory Committee (HICPAC) developed hand hygiene guidelines in 2002, in collaboration with the Society for Healthcare Epidemiology of America (SHEA), APIC, and the Infectious Diseases Society of America (IDSA). The CDC promotes hand hygiene through its extensive references and resources available on its Web site (http://www.cdc.gov), and it recently partnered with APIC and the Safe Care Campaign to make the patient safety DVD "Hand Hygiene Saves Lives."

Institute for Heathcare Improvement

The IHI, an independent not-for-profit organization founded in 1991 and located in Cambridge, Massachusetts, strives to accelerate improvement in health and health care worldwide by helping individuals develop skills to lead

improvement initiatives and facilitate organizational change. The IHI supports extensive resources, many of which are available at its Web site (http://www.ihi.org), including educational conferences and seminars on improvement initiatives and techniques, documents and tools for improvement, and networking for its members. To help organizations reduce health care–associated infections by improving hand hygiene, the IHI recently developed the *How-to Guide: Improving Hand Hygiene*, in collaboration with the CDC, APIC, and SHEA.

National Foundation for Infectious Diseases

The National Foundation for Infectious Diseases (NFID), a nonprofit organization founded in 1973 and located in Bethesda, Maryland, is dedicated to educating health care professionals and the public about the causes, treatment, and prevention of infectious diseases. The NFID holds conferences and meetings on various infectious disease topics and provides publications, fact sheets, and a virtual library on infectious diseases to health professionals and the public on its Web site (http://www.nfid.org). Recognizing the important role that hand hygiene plays in the transmission of infectious diseases and conditions, the NFID has incorporated information about hand hygiene into many of its fact sheets and educational materials.

Society for Healthcare Epidemiology of America

SHEA, located in Rosslyn, Virginia, was organized in 1980 to foster the development and application of the science of health care epidemiology. SHEA's mission to prevent and control infections in health care organizations is evident in its educational offerings, online resource materials, and development of practice guidelines (see http://www.shea-online.org). SHEA was a member of the hand hygiene task force that developed the 2002 "Guideline for Hand Hygiene in Health-Care Settings" and the IHI panel that developed the IHI *How-to Guide: Improving Hand Hygiene*.

World Health Organization

The World Health Organization (WHO) in Geneva, Switzerland, is the coordinating and directing authority for health within the United Nations systems. Founded in 1948, the WHO's responsibilities include providing leadership on global health matters, setting norms and standards, monitoring and assessing health trends, and providing evidence-based recommendations and technical support to countries. In 2004 the WHO initiated the World Alliance for Patient Safety (WAPS), which raises awareness to improve safe care and facilitates the development of patient safety policy and practices in all WHO member states. The first Global Patient Safety Challenge, "Clean Care Is Safer Care," was launched in October 2005, with its initial focus on hand hygiene. Expanding on the Swiss national hand hygiene campaign educational and promotional tools, the WHO developed draft guidelines for hand hygiene that have been extensively field tested. The guidelines were finalized in 2008 and are being officially reissued during the first quarter of 2009.

Examples of resources from the collaborating organizations in the Consensus Measurement in Hand Hygiene (CMHH) are listed in Table 10-1.

Joint Commission Initiatives

The Joint Commission, the WHO Collaborating Centre for Patient Safety Solutions, and Joint Commission Resources (JCR) all have useful resources related to improving hand hygiene adherence, some of which are listed in Table 10-2.

International Resources

Globally there is much interest in improving hand hygiene adherence. There are several initiatives in place that have field-tested publicly available data collection tools, training programs, and implementation strategies. Some of these international initiatives are highlighted in Table 10-3.

Additional Resources

Table 10-4 provides additional resources from organizations that have Web sites that provide hand hygiene resources.

Table 10-1.
Resources from the Consensus Measurement in Hand Hygiene (CMHH) Project Collaborators

Web Site	Description
Association for Professional in Infection Control and Epidemiology, Inc. (APIC)	
http://www.apic.org/Content/NavigationMenu/Education/EducationResources/EducationalBrochures/Educational_Brochur.htm	This site links the reader to several general educational brochures for both the general public and health care workers on various infection control and infectious disease-related topics, including hand hygiene.
http://www.knowledgeisinfectious.org	This site is dedicated to the provision and exchange of information on the control and eradication of health care–associated infections (HAIs). It is designed to promote open dialogue among infection prevention and control professionals, hospital administration executives, physicians, and other health care professionals. Includes links to other Web sites, guidelines, news, research, and upcoming events related to the prevention and control of HAIs.
Centers for Disease Control and Prevention (CDC)	
http://www.cdc.gov/handhygiene	The CDC's hand hygiene site contains links to the following, as well as other educational resources on hand hygiene: • The CDC's 2002 Guideline for Hand Hygiene in Healthcare Settings • The "Hand Hygiene Interactive Training Course," which reviews key concepts of hand hygiene and other standard precautions to prevent health care–associated infections. It also contains a link to printable versions of five different full-size hand hygiene promotional posters. The patient admission video "Hand Hygiene Saves Lives," which teaches patients and visitors the importance of hand hygiene and encourages them to remind health care workers to practice hand hygiene. This video was a collaborative project between CDC, APIC, and the Safe Care Campaign.
http://www.cdc.gov/cleanhands/	This site contains information for the general public on hand hygiene.
Institute for Healthcare Improvement (IHI)	
http://www.ihi.org/IHI/Topics/CriticalCare/IntensiveCare/Tools/HowtoGuideImprovingHandHygiene.htm	The IHI's How-to Guide: Improving Hand Hygiene was developed in collaboration with CDC, APIC, and SHEA, with input from the WHO's World Alliance for Patient Safety
National Foundation for Infectious Diseases (NFID)	
http://www.nfid.org/factsheets	This site makes available informational fact sheets, such as "Community-Associated Methicillin-Resistant *Staphylococcus aureus* Infections," which discuss aspects of prevention, such as using good hand hygiene.
http://www.nfid.org/docs/workplaceflu.html	NFID has developed an educational bulletin titled "Help Reduce the FLU@Work" that can be posted in the workplace to help companies minimize the spread of flu. The bulletin highlights the importance of hand hygiene in flu prevention.

Table 10-1. (continued)

Web Site	Description
Society for Healthcare Epidemiology of America (SHEA)	
http://www.shea-online.org/hand_hygiene-page.cfm	This is SHEA's hand hygiene site, which provides links to relevant resources regarding hand hygiene. The site contains links to the 2002 CDC guideline on hand hygiene, as well as news, published research, and SHEA abstracts related to hand hygiene.
http://www.shea-online.org/search_results.cfv?srchterm=hand+hygiene	This site provides links to numerous topics and studies related to hand hygiene.
World Health Organization (WHO) World Alliance for Patient Safety (WAPS)	
http://www.who.int/gpsc/en/	This is the home page for the WHO's "Clean Care Is Safer Care" initiative, the WHO's first Global Patient Safety Challenge. It provides links to multiple aspects of the challenge, including the following: • A description of the pilot testing of the WHO's hand hygiene guideline • Hand hygiene tools, resources, and information, including the following: — The "Five Moments for Hand Hygiene" poster and associated tools — The WHO Guideline on Hand Hygiene in Health Care (Advanced Draft): A Summary • Articles related to the challenge
Multiple Partners	
http://www.journals.uchicago.edu/toc/iche/2008/29/s1	The "Compendium of Strategies to Prevent Healthcare-Associated Infections in Acute Care Hospitals" describes indications for hand hygiene in relation to recommended practices for preventing the following infections: central line–associated blood stream infections, ventilator-associated pneumonia, catheter-associated urinary tract infections, surgical site infections, transmission of methicillin-resistant Staphylococcus aureus (MRSA), and Clostridium difficile infections. The information was published in Volume 29 of Infection Control and Hospital Epidemiology in 2008.

Table 10-2.
Resources from The Joint Commission, the WHO Collaborating Centre for Patient Safety, and Joint Commission Resources

Web Site	Description
The Joint Commission	
http://www.jointcommission.org/PatientSafety/SpeakUp/	The Joint Commission's Speak Up! campaign includes two printer-friendly brochures and posters that discuss the importance of hand hygiene: • "Five Things You Can Do to Prevent Infections" • "Help Prevent Errors in Your Care"
The WHO Collaborating Centre for Patient Safety Solutions	
http://www.ccforpatientsafety.org	This is the home page for the WHO Collaborating Centre for Patient Safety Solutions, devoted to improving the overall quality of care and advancing patient safety. The basic purpose of the solutions is to guide the redesign of care processes to prevent inevitable human errors from actually reaching patients. From this page there are links to the following: • "Patient Safety Solutions," including "Solution Nine," which describes the issues surrounding hand hygiene in health care organizations and provides suggested actions for promoting hand hygiene adherence as well as references and other resources • Information about the "High 5s Project," a collaboration between the Commonwealth Fund, the WHO World Alliance for Patient Safety, and the WHO Collaborating Center for Patient Safety. This initiative is a mechanism to implement innovative standardized operating protocols for five patient safety solutions over five years, with promotion of effective hand hygiene practices one of the chosen solution areas.
Joint Commission Resources (JCR)	
http://www.jcrinc.com	From JCR's home page, you can access a number of resources related to hand hygiene by searching on "hand hygiene" in the "Products and Services" section. Available products include "Ask Me if I Washed My Hands" and "Stopping Infection Is in Our Hands" buttons for health care workers to wear; posters to communicate the importance of adhering to recommended hand hygiene practices; and a multimedia toolkit designed to help organizations implement National Patient Safety Goal 7. In 2008, JCR published a toolkit called, "Hand Hygiene: Toolkit for Implementing the National Patient Safety Goal" to help organizations comply with Joint Commision accreditation requirements.

Table 10-3.
International Resources

Web Site	Description
WHO-WAPS "Clean Care Is Safer Care"	
See Table 10-1.	
England and Wales National Patient Safety Agency (NPSA) "cleanyourhands" Campaign	
http://www.npsa.nhs.uk/cleanyourhands	This is the home page for the campaign launched by the England and Wales NPSA in April 2005. All pages have links to the training video; the links at the top of this page will take you to the following: • The Campaign: Includes the latest news and approaches used and describes the components of the campaign. • Achievements: Includes independent evaluation of the effectiveness of the campaign. • The Campaign in Hospitals: Describes the campaign's implementation in hospitals and provides a link to the Hand Hygiene Observation Tool (HHOT), including instructions for its use. The remaining links at the top of the home page include links for the campaign in the community, FAQs, useful links, and campaign contact information.
http://www.idrn.org/nosec.php	This is the direct link to the National Observational Study to Evaluate the cleanyourhands Campaign (NOSEC), as well as the full version and short summary of the standard operating procedures for the HHOT.
Ontario, Canada "Just Clean Your Hands" Program	
http://www.justcleanyourhands.ca	This is the home page for Ontario's hand hygiene program. From this page, there are links to extensive resources, such as the following: • An overview of the program, which includes A Quick Guide to Just Clean Your Hands • Environmental aspects of the program, including placement of hand hygiene products and the skin care program • Training and education resources, such as PowerPoint presentations and a Q&A document • The observation tool and evaluation materials • The "Observation Analysis Tool," an Excel workbook to assist in analyzing data collected using the observation tool • The "On the Spot" feedback tool • Role descriptions for "champion" and "observer" • Reminders, such as posters and pocket cards • A step-by-step guide for local implementation of the program

Table 10-3. (continued)

Web Site	Description
New South Wales, Australia's "The Clean Hands Saves Lives" Campaign	
http://www.cec.health.nsw.gov.au/moreinfo/cleanhandsintro.html	From the NSW campaign home page there are links to many resources, including the following: • An overview of campaign posters and educational materials for health care workers, patients, and visitors • An Implementation Guide, as well as a hand hygiene assessment tool and several fact sheets
Scotland, United Kingdom "Germs, Wash Your Hands of Them" Campaign	
http://www.washyourhandsofthem.com/	The campaign, launched by Health Protection Scotland (HPS), has links from its home page to various resources, including the following: • An overview of the campaign • Campaign materials, such as posters, leaflets, and other hand hygiene documents
http://www.hps.scot.nhs.uk/haiic/ic/handhygiene.aspx	This is the Web site for HPS's "HAI & Infection Control Resource Centre for the Hand Hygiene" model infection control policy. It includes a range of practical resources that can be used to support local activities regarding hand hygiene.
University of Geneva Hospitals, Geneva, Switzerland	
http://www.hopisafe.ch	This Web site was created by the University of Geneva Hospitals [Hopitaux Universities de Geneve (HUG)] to share its experience in implementing a hospitalwide, multimodal hand hygiene program. This Web site offers the following: • The action agenda, which describes HUG's initiative • Geneva posters ("Talking Walls") • Results of the initiative • References and links regarding hand hygiene
Swiss "swisshandhygiene" Campaign	
http://www.swisshandhygiene.ch	This Web site contains information on the swisshandhygiene campaign (in French).
Canadian Patient Safety Institute (CPSI) "STOP! Clean Your Hands" Campaign	
http://handhygiene.ca	This is the home page for the pan-Canadian hand hygiene campaign, launched in October 2007, intended to support, supplement, and integrate existing hand hygiene initiatives locally, regionally, and provincially. The site contains links to hand hygiene resources and references, FAQs, and information for Canadian organizations that are interested in joining the campaign.

Table 10-4.
Additional Resources

Web Site	Description
Department of Veterans Affairs	
http://www.va.gov/ncps/SafetyTopics/HandHygiene/index.html	This site includes hand hygiene tools and information, including the following: • A hand hygiene/glove use observation tool for recording hand hygiene practices and instructions for using the tool • A health care worker questionnaire for measuring perceptions and attitudes regarding hand hygiene • An Excel spreadsheet for computing grams of alcohol product used per patient day • A checklist of interventions developed in the VA-3M Six Sigma Project to improve Hand Hygiene Practices • Sample data from four VA medical center intensive care units • Links to hand hygiene references and Web sites
http://www.publichealth.va.gov/InfectionDontPassItOn/	"Infection: Don't Pass It On" campaign is a VA public health campaign. The goal of the campaign is to involve staff, patients, and visitors in taking basic steps to preventing infection. The focus of the campaign is hand hygiene and cough etiquette, and the site includes posters that are printer-ready.
Hand Hygiene Resource Center—Project of St. Raphael Healthcare System	
http://www.handhygiene.org	The Hand Hygiene Resource Center was developed by St. Raphael Healthcare System and Dr. John Boyce. The site includes many resources, including the following: • PowerPoint slide presentations on improving hand hygiene in health care facilities • A guidance document on selecting the right hand rub • St. Raphael's hand hygiene monitoring tool
Safe Care Campaign	
http://www.safecarecampaign.org	The Safe Care Campaign Web site was developed by Victoria and Armando Nahum after three health care–associated infections, culminating in the death of their son in 2006. The campaign's focus is on stopping health care–associated and community infections. This Web site contains many resources, including information on hand hygiene for both health care workers and patients/families and "A Patient's Guide to Safe Care."

appendix

Examples of Measurement Tools

This Appendix provides examples of some of the tools that are described in the monograph. The examples are provided to illustrate concepts in the text and are not intended to be complete, comprehensive or used without additional information.

We strongly encourage readers to go directly to the tool developers and sources described in Chapter 10 of the monograph to get the most recent versions of tools and instructions. Tools are modified frequently and space constraints generally prohibit including essential components such as instructions for use, training materials and analysis recommendations.

List of Tools

Type of Tool	Tool Number	Name of Tool	Developer	Source of Information
Observation Tools	1	World Health Organization (WHO) Observation Tool and Calculation Forms	WHO, World Alliance for Patient Safety	http://www.who.int/gpsc/en/
	2	WHO Basic Hand Hygiene Observation Tool	WHO, World Alliance for Patient Safety	http://www.who.int/gpsc/en/
	3	Ontario Observation Tool	Ministry of Health and Long Term Care, Ontario, Canada	http://www.justcleanyourhands.ca/
	4	England and Wales National Patient Safety Agency (NPSA) Hand Hygiene Observation Tool (HHOT)	NPSA, London, England	http://www.npsa.nhs.uk/cleanyourhands
	5	Reedsburg Area Medical Center Observation Tool	Reedsburg Area Medical Center Reedsburg, WI	Rita Schara e-mail: rschara@ramchealth.org
	6	Mayo Clinic Hand Hygiene and Glove Use Monitoring Form	Mayo Clinic Rochester, MN	W. Charles Huskins e-mail: Huskins.charles@mayo.edu
	7	Australia Overt Observational Instructions and Tool	New South Wales (NSW) Government Sydney, NSW, Australia	http://www.cec.health.nsw.gov.au/moreinfo/cleanhands_intro.html
Knowledge and Attitude Surveys	8	WHO Hand Hygiene Knowledge Test for Healthcare Workers	WHO, World Alliance for Patient Safety	http://www.who.int/gpsc/en/
	9	Institute for Healthcare Improvement (IHI) Hand Hygiene Knowledge Assessment Questionnaire	IHI Cambridge, MA	http://www.ihi.org/IHI/Topics/CriticalCare/IntensiveCare/Tools HowtoGuideImprovingHandHygiene.htm

List of Tools (cont'd)

	10	WHO Baseline Questionnaire of the Perception of Hand Hygiene and Healthcare-associated Infections	WHO, World Alliance for Patient Safety	http://www.who.int/gpsc/en/
	11	WHO Questionnaire on the Perceptions of Hand Hygiene and Healthcare-associated Infections for Senior Executive Managers	WHO, World Alliance for Patient Safety	http://www.who.int/gpsc/en/
	12	Ontario Baseline Hand Hygiene Perception Survey	Ministry of Health and Long Term Care, Ontario, Canada	http://www.justcleanyourhands.ca/
	13	Larson (2004) Attitudes Regarding Practice Guidelines	Elaine Larson New York, NY	A tool to assess barriers to adherence to hand hygiene guideline. Am J Infect Control. 2004 Feb;32(1):48-51.
Structural Surveys	14	WHO Questionnaire on Ward Structures for Hand Hygiene	WHO, World Alliance for Patient Safety	http://www.who.int/gpsc/en/
	15	Ontario Baseline Hand Hygiene Unit Structures Survey	Ministry of Health and Long Term Care, Ontario, Canada	http://www.justcleanyourhands.ca/
	16	Ontario Facility–level Situation Assessment	Ministry of Health and Long Term Care, Ontario, Canada	http://www.justcleanyourhands.ca/
Other Surveys	17	Ontario Appendix I: Patient Discharge Questionnaire	Ministry of Health and Long Term Care, Ontario, Canada	http://www.justcleanyourhands.ca/
	18	Ontario Appendix H: Healthcare Worker Focus Group Guide	Ministry of Health and Long Term Care, Ontario, Canada	http://www.justcleanyourhands.ca/
	19	WHO Evaluation of tolerability and acceptability of alcohol-based hand rub	WHO, World Alliance for Patient Safety	http://www.who.int/gpsc/en/
	20	Ontario Assessment Tool for Health Care Provider Hands	Ministry of Health and Long Term Care, Ontario, Canada	http://www.justcleanyourhands.ca/

Observation Tool 1 – WHO Observation Tool & Calculation Forms

WORLD ALLIANCE *for* PATIENT SAFETY

World Health Organization

ANNEX 34

OBSERVATION FORM

Country	City	Hospital	Site ID

Observer (initials)			
Date (dd.mm.yyyy)	. .	**Period No.**	**Department**
Start/End time (hh:mm)	: / :	**Session No.**	**Service name**
Session duration (mm)		**Form No.**	**Ward name**

Prof.cat.
Code
Number

Opp	Indication	Action
1	☐ bef-pat. ☐ bef-asept. ☐ aft-bfluid ☐ aft-pat. ☐ aft-surr.	☐ rub ☐ wash ○ missed
2	☐ bef-pat. ☐ bef-asept. ☐ aft-bfluid ☐ aft-pat. ☐ aft-surr.	☐ rub ☐ wash ○ missed
3	☐ bef-pat. ☐ bef-asept. ☐ aft-bfluid ☐ aft-pat. ☐ aft-surr.	☐ rub ☐ wash ○ missed
4	☐ bef-pat. ☐ bef-asept. ☐ aft-bfluid ☐ aft-pat. ☐ aft-surr.	☐ rub ☐ wash ○ missed
5	☐ bef-pat. ☐ bef-asept. ☐ aft-bfluid ☐ aft-pat. ☐ aft-surr.	☐ rub ☐ wash ○ missed
6	☐ bef-pat. ☐ bef-asept. ☐ aft-bfluid ☐ aft-pat. ☐ aft-surr.	☐ rub ☐ wash ○ missed
7	☐ bef-pat. ☐ bef-asept. ☐ aft-bfluid ☐ aft-pat. ☐ aft-surr.	☐ rub ☐ wash ○ missed
8	☐ bef-pat. ☐ bef-asept. ☐ aft-bfluid ☐ aft-pat. ☐ aft-surr.	☐ rub ☐ wash ○ missed

Prof.cat.
Code
Number

Opp	Indication	Action
1	☐ bef-pat. ☐ bef-asept. ☐ aft-bfluid ☐ aft-pat. ☐ aft-surr.	☐ rub ☐ wash ○ missed
2	☐ bef-pat. ☐ bef-asept. ☐ aft-bfluid ☐ aft-pat. ☐ aft-surr.	☐ rub ☐ wash ○ missed
3	☐ bef-pat. ☐ bef-asept. ☐ aft-bfluid ☐ aft-pat. ☐ aft-surr.	☐ rub ☐ wash ○ missed
4	☐ bef-pat. ☐ bef-asept. ☐ aft-bfluid ☐ aft-pat. ☐ aft-surr.	☐ rub ☐ wash ○ missed
5	☐ bef-pat. ☐ bef-asept. ☐ aft-bfluid ☐ aft-pat. ☐ aft-surr.	☐ rub ☐ wash ○ missed
6	☐ bef-pat. ☐ bef-asept. ☐ aft-bfluid ☐ aft-pat. ☐ aft-surr.	☐ rub ☐ wash ○ missed
7	☐ bef-pat. ☐ bef-asept. ☐ aft-bfluid ☐ aft-pat. ☐ aft-surr.	☐ rub ☐ wash ○ missed
8	☐ bef-pat. ☐ bef-asept. ☐ aft-bfluid ☐ aft-pat. ☐ aft-surr.	☐ rub ☐ wash ○ missed

Prof.cat.
Code
Number

Opp	Indication	Action
1	☐ bef-pat. ☐ bef-asept. ☐ aft-bfluid ☐ aft-pat. ☐ aft-surr.	☐ rub ☐ wash ○ missed
2	☐ bef-pat. ☐ bef-asept. ☐ aft-bfluid ☐ aft-pat. ☐ aft-surr.	☐ rub ☐ wash ○ missed
3	☐ bef-pat. ☐ bef-asept. ☐ aft-bfluid ☐ aft-pat. ☐ aft-surr.	☐ rub ☐ wash ○ missed
4	☐ bef-pat. ☐ bef-asept. ☐ aft-bfluid ☐ aft-pat. ☐ aft-surr.	☐ rub ☐ wash ○ missed
5	☐ bef-pat. ☐ bef-asept. ☐ aft-bfluid ☐ aft-pat. ☐ aft-surr.	☐ rub ☐ wash ○ missed
6	☐ bef-pat. ☐ bef-asept. ☐ aft-bfluid ☐ aft-pat. ☐ aft-surr.	☐ rub ☐ wash ○ missed
7	☐ bef-pat. ☐ bef-asept. ☐ aft-bfluid ☐ aft-pat. ☐ aft-surr.	☐ rub ☐ wash ○ missed
8	☐ bef-pat. ☐ bef-asept. ☐ aft-bfluid ☐ aft-pat. ☐ aft-surr.	☐ rub ☐ wash ○ missed

Prof.cat.
Code
Number

Opp	Indication	Action
1	☐ bef-pat. ☐ bef-asept. ☐ aft-bfluid ☐ aft-pat. ☐ aft-surr.	☐ rub ☐ wash ○ missed
2	☐ bef-pat. ☐ bef-asept. ☐ aft-bfluid ☐ aft-pat. ☐ aft-surr.	☐ rub ☐ wash ○ missed
3	☐ bef-pat. ☐ bef-asept. ☐ aft-bfluid ☐ aft-pat. ☐ aft-surr.	☐ rub ☐ wash ○ missed
4	☐ bef-pat. ☐ bef-asept. ☐ aft-bfluid ☐ aft-pat. ☐ aft-surr.	☐ rub ☐ wash ○ missed
5	☐ bef-pat. ☐ bef-asept. ☐ aft-bfluid ☐ aft-pat. ☐ aft-surr.	☐ rub ☐ wash ○ missed
6	☐ bef-pat. ☐ bef-asept. ☐ aft-bfluid ☐ aft-pat. ☐ aft-surr.	☐ rub ☐ wash ○ missed
7	☐ bef-pat. ☐ bef-asept. ☐ aft-bfluid ☐ aft-pat. ☐ aft-surr.	☐ rub ☐ wash ○ missed
8	☐ bef-pat. ☐ bef-asept. ☐ aft-bfluid ☐ aft-pat. ☐ aft-surr.	☐ rub ☐ wash ○ missed

January 2007

General recommendations (refer to chapter 2.2 of the Reference Manual for Observer)

1. Introduce yourself to the observed health-care workers and patients as appropriate and indicate the reason for your presence.
2. You may observe up to 3 health-care workers simultaneously if the density of action permits.
3. You may include more health-care workers sequentially during one observation session.
4. Find a convenient place to observe without disturbing care activities; you can move to follow the health-care workers, but never interfere with their work. However, you can provide feedback after the session.

How to use the form (refer to chapter 2.2 of the Reference Manual for Observer)

5. Use a pencil to fill in the form and a rubber to correct errors; use a rigid support to hold the form (during observations).
6. Complete the details at the top of the form (except end time and session duration).
7. As soon as you count the first opportunity for hand hygiene, indicate the corresponding information (indication(s), action) in the first of the numbered opportunity boxes that read from top to bottom. Enter it in the column corresponding to the professional category of the observed health-care worker.
8. Each opportunity refers to one line in each column; each line is independent from one column to another.
9. Put a cross in the small square or circle corresponding to the correct item (the square means several items can be chosen; the circle means only one item can be chosen).
10. In the case of several indications falling into one opportunity, cross the square corresponding to each indication.
11. Performed or missed actions must always be registered within the context of an opportunity.
12. Do not forget to note the end time, to calculate the session duration and to check data before returning the form.

Short description of items (refer to chapter 2.2 of the Reference Manual for Observer)

Country / City:	give in full (do not use abrevations)
Hospital:	give in full (do not use abrevations)
Site ID:	according to WHO codes (provided by co-ordinator).
Observer:	initials (first name / family name).
Date:	day / month / year.
Start / End-time:	hour / minute.
Session duration:	difference between start and end time, result in minutes.
Period No:	according to the institutional counter.
Session No:	according to the institutional counter.
Form No:	number of pages.
Department:	according to the following nomenclature: medical (including dermatology, neurology, haematology, etc.) mixed (medical & surgical) paediatrics (including related surgery) emergency unit outpatient clinic (including related surgery) surgical (including ENT, ophthalmology, eurosurgery, etc.) obstetrics (including related surgery) ICU long term & rehabilitation other (to specify)
Service / Ward name:	according to the institutional nomenclature.
Prof. Cat. / Code:	**according to the following classification:** 1. nurse / midwife — 1.1 nurse, 1.2 midwife, 1.3 student, 2. auxiliary 3. medical doctor — 3.1 in clinical medicine, 3.2 surgeon, 3.3 anaesthetist, 3.4 paediatrician, 3.5 other, 3.6 medical student 4. other health-care worker — 4.1 therapist (physiotherapist, occupational therapist, audiologist, speech therapist, etc.) 4.2 technician (radiologist, cardiology technician, operating room technician, cardiology technician, laboratory technician, etc.) 4.3 other (dietician, dentist, social worker and any other health-related professional involved in patient care)
Number:	enter the number of observed health-care workers belonging to the same professional category (same code) as they enter the field of observation
Opportunity:	defined by at least one indication.
Indication:	motivates the hand hygiene action bef-pat.: before patient contact bef-asept.: before an aseptic task aft-bfluid: after body fluid exposure risk aft-pat.: after patient contact aft-surr.: after contact with patient surroundings
Action:	response to the hand hygiene indication(s) rub: when hand hygiene is performed with an alcohol-based formulation wash: when hand hygiene is performed with soap and water **missed:** when no action is performed

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WORLD ALLIANCE *for* PATIENT SAFETY

World Health Organization

BASIC CALCULATION FORM

Country	City	Hospital	Site ID

Date (dd.mm.yyyy)	Period N°.	Department Service Ward

Session N°.	Professional categories (columns can be added according to the number of professional categories observed)								Total of sessions	
	Prof.cat. Code		Prof.cat. Code		Prof.cat. Code		Prof.cat. Code			
	Opportunity	Action	Opportunity	Action	Opportunity	Action	Opportunity	Action	Opportunity	Action
1										
2										
3										
4										
5										
6										
7										
8										
9										
10										
11										
12										
13										
14										
15										
16										
17										
18										
19										
20										
21										
22										
23										
24										
25										
Total by categories										
Compliance										

$$\text{Compliance (\%)} = \frac{\text{Actions}}{\text{Opportunities}} * 100$$

Instructions for use

1. Check data collected in observation form. Calculate the sums of the opportunities and actions according to the professional category from each observation session and copy the results on the lines corresponding to the session number.
2. Calculate the sum of the opportunities and the sum of the actions along the lines to obtain the total sum of each session.
3. Calculate the sum of opportunities and actions of all sessions and the overall compliance by applying the equation above.
4. Calculate the sums of the opportunities and actions over all professional categories and calculate compliance by categories by applying the equation. Complete result on the "Compliance" line and in each "Total by categories" column.

WORLD ALLIANCE for PATIENT SAFETY

World Health Organization

OPTIONAL CALCULATION FORM

(Indication related compliance with hand hygiene)

Country	City	Hospital	Site ID

Date (dd.mm.yyyy)	Period N°.	Department Service Ward

Session N°.	Hand Hygiene Indications									
	Before patient contact		Before aseptic task		After body fluid exposure risk		After patient contact		After contact with patient surroundings	
	Number	Action	Number	Action	Number	Action	Number	Action	Number	Action
1										
2										
3										
4										
5										
6										
7										
8										
9										
10										
11										
12										
13										
14										
15										
16										
17										
18										
19										
20										
21										
22										
23										
24										
25										
Total by indications										
Compliance										

$$\text{Compliance } (\%) = \frac{\text{Actions}}{\text{Indications}} * 100$$

Instructions for use

5. Check data collected in observation form. Calculate and copy the sums of indications and its regarding actions from each observation session.
6. If several indications occur within a same opportunity, each one should be considered separately as well as the related action.
7. Apply the compliance equation to calculate the compliance per indication and copy the results on the *"Compliance"* line and in the corresponding columns.

Note : This calculation is not exactly a compliance result, as the denominator of the calculation is an indication instead of an opportunity. Action is artificially over estimated according to each indication. However, the result gives an overall idea of health-care worker's behaviour towards each type of indication.

Observation Tool 2 – WHO Basic Hand Hygiene Obs. Tool

World Health Organization

WHO BASIC HAND HYGIENE OBSERVATION TOOL (version 1.0)

Observer ID (initials):	|_|_|_|_|	Period-No.	|_|_|_|	Institution-ID	|_|_|_|_|_|
Date (dd.mm.yyyy)	|_|_|.|_|_|.|_|_|_|_|	Session-No.	|_|_|_|	Sector type	|_|_|_|_|_|
Start time (hh:mm)	|_|_|:|_|_|	Form-No.	|_|_|_|	Sector name	|_|_|_|_|_|
End time (hh:mm)	|_|_|:|_|_|			Ward name	|_|_|_|_|_|

Nurses	Aux nurses	Other 1 _____	Other 2 _____
① ② ③ ④ ⑤ ⑥ ⑦ ⑧ ⑨ ⑩	① ② ③ ④ ⑤ ⑥ ⑦ ⑧ ⑨ ⑩	① ② ③ ④ ⑤ ⑥ ⑦ ⑧ ⑨ ⑩	① ② ③ ④ ⑤ ⑥ ⑦ ⑧ ⑨ ⑩
1 ☐ BEF-PAT ☐ AFT-PAT ☐ Rub ☐ Wash ○ Missed	1 ☐ BEF-PAT ☐ AFT-PAT ☐ Rub ☐ Wash ○ Missed	1 ☐ BEF-PAT ☐ AFT-PAT ☐ Rub ☐ Wash ○ Missed	1 ☐ BEF-PAT ☐ AFT-PAT ☐ Rub ☐ Wash ○ Missed
2 ☐ BEF-PAT ☐ AFT-PAT ☐ Rub ☐ Wash ○ Missed	2 ☐ BEF-PAT ☐ AFT-PAT ☐ Rub ☐ Wash ○ Missed	2 ☐ BEF-PAT ☐ AFT-PAT ☐ Rub ☐ Wash ○ Missed	2 ☐ BEF-PAT ☐ AFT-PAT ☐ Rub ☐ Wash ○ Missed
3 ☐ BEF-PAT ☐ AFT-PAT ☐ Rub ☐ Wash ○ Missed	3 ☐ BEF-PAT ☐ AFT-PAT ☐ Rub ☐ Wash ○ Missed	3 ☐ BEF-PAT ☐ AFT-PAT ☐ Rub ☐ Wash ○ Missed	3 ☐ BEF-PAT ☐ AFT-PAT ☐ Rub ☐ Wash ○ Missed
4 ☐ BEF-PAT ☐ AFT-PAT ☐ Rub ☐ Wash ○ Missed	4 ☐ BEF-PAT ☐ AFT-PAT ☐ Rub ☐ Wash ○ Missed	4 ☐ BEF-PAT ☐ AFT-PAT ☐ Rub ☐ Wash ○ Missed	4 ☐ BEF-PAT ☐ AFT-PAT ☐ Rub ☐ Wash ○ Missed
5 ☐ BEF-PAT ☐ AFT-PAT ☐ Rub ☐ Wash ○ Missed	5 ☐ BEF-PAT ☐ AFT-PAT ☐ Rub ☐ Wash ○ Missed	5 ☐ BEF-PAT ☐ AFT-PAT ☐ Rub ☐ Wash ○ Missed	5 ☐ BEF-PAT ☐ AFT-PAT ☐ Rub ☐ Wash ○ Missed
6 ☐ BEF-PAT ☐ AFT-PAT ☐ Rub ☐ Wash ○ Missed	6 ☐ BEF-PAT ☐ AFT-PAT ☐ Rub ☐ Wash ○ Missed	6 ☐ BEF-PAT ☐ AFT-PAT ☐ Rub ☐ Wash ○ Missed	6 ☐ BEF-PAT ☐ AFT-PAT ☐ Rub ☐ Wash ○ Missed
7 ☐ BEF-PAT ☐ AFT-PAT ☐ Rub ☐ Wash ○ Missed	7 ☐ BEF-PAT ☐ AFT-PAT ☐ Rub ☐ Wash ○ Missed	7 ☐ BEF-PAT ☐ AFT-PAT ☐ Rub ☐ Wash ○ Missed	7 ☐ BEF-PAT ☐ AFT-PAT ☐ Rub ☐ Wash ○ Missed
8 ☐ BEF-PAT ☐ AFT-PAT ☐ Rub ☐ Wash ○ Missed	8 ☐ BEF-PAT ☐ AFT-PAT ☐ Rub ☐ Wash ○ Missed	8 ☐ BEF-PAT ☐ AFT-PAT ☐ Rub ☐ Wash ○ Missed	8 ☐ BEF-PAT ☐ AFT-PAT ☐ Rub ☐ Wash ○ Missed
9 ☐ BEF-PAT ☐ AFT-PAT ☐ Rub ☐ Wash ○ Missed	9 ☐ BEF-PAT ☐ AFT-PAT ☐ Rub ☐ Wash ○ Missed	9 ☐ BEF-PAT ☐ AFT-PAT ☐ Rub ☐ Wash ○ Missed	9 ☐ BEF-PAT ☐ AFT-PAT ☐ Rub ☐ Wash ○ Missed
10 ☐ BEF-PAT ☐ AFT-PAT ☐ Rub ☐ Wash ○ Missed	10 ☐ BEF-PAT ☐ AFT-PAT ☐ Rub ☐ Wash ○ Missed	10 ☐ BEF-PAT ☐ AFT-PAT ☐ Rub ☐ Wash ○ Missed	10 ☐ BEF-PAT ☐ AFT-PAT ☐ Rub ☐ Wash ○ Missed

1

World Health Organization

WHO BASIC HAND HYGIENE OBSERVATION TOOL (version 1.0)

Observation guide

1. Choose the area (ward, sector, etc) according to the scope of the observation period.
2. Choose the time of the day where care activity takes place and chances are that you may observe hand hygiene opportunities.
3. Choose healthcare workers to be observed according the scope of your observation.

   Note: *if you want to obtain comparison over several periods in time make sure to repeat observations according to the same scheme.*
4. Use a pencil to fill in the form and a rubber to correct.
5. Introduce yourself to the observed healthcare workers and patients as appropriate indicating the reason for your presence.
6. One observations session goes on 20 minutes, ±10 minutes; prolong the session if you get the chance to observe a care sequence to its end. Otherwise, terminate it earlier if no care activity will cease.
7. If you are an experienced observer – and the density of actions allows it without loosing track – you may observe up to 3 healthcare workers simultaneously. You may include more healthcare workers sequentially during one observation session.
8. Place yourself at a convenient place to observe, without disturbing activities; you may also move to follow the healthcare workers discreetly.
9. Do not interfere with the observed healthcare workers during the session (you might give feedback after the session).
10. First, fill in the head of the form by indicating your initials (**Observer-ID**), the date, the current time (**Start time**), the number of the observation period (group of sessions with the same scope), the number of this session (**Session-No**), the number of the form used for a single session (**Form-No.**; see also point 16), the identity of your institution attributed by WHO (**Institution-ID**), the identity of the sector in which you perform this session (**Sector type**), the local name of this sector (**Sector name**), the identity of the ward (**Ward-ID**).
11. As soon as you observe the first opportunity for hand hygiene, indicate the corresponding information in the first of the numbered opportunity sections that read from the top to the bottom in the column corresponding to the professional category to which the observed person belongs (**Nurses**, **Physicians**, or **Other 1** and **2** which offers the possibility to enter 2 other professional categories according to your choice).
12. For each opportunity indicate one or several of the following indications (=reasons, motives) for hand hygiene:
    - **BEF-PAT** = "*before patient contact*" if the healthcare worker is going to touch the patient (or his/her immediate environment) for the first time for a care sequence and after having touched the hospital environment (= any other surface not in the patient's immediate vicinity) or another patient before
    - **AFT-PAT** = "*after patient contact*" if the healthcare worker is leaving the patient (or his/her immediate environment) to go on working in the hospital environment or with another patient.

    Note:

    If there is a direct transition from one patient to another without touching the hospital environment on the way, tick both **BEF-PAT** and **AFT-PAT** for this opportunity because this situation requires only one single hand hygiene action even if there are two distinct indications. Gloves that are not removed after a care task may lead to a missed opportunity.
13. Next, tick alternatively, either the hand hygiene action (**Rub** or **Wash** or both) or the missing action (**Missing**) as occurring for this hand hygiene opportunity.
14. If a second healthcare worker of the same category is observed mark another counter number (i.e. ②) in the header of the column as you go along to obtain the sum of observed healthcare workers in each category in the end.
15. Proceed accordingly with healthcare workers from other categories that you might observe simultaneously or sequentially.
16. If you observe more than 10 opportunities for a given professional category, use another form numbering them accordingly in the variable **Form-No**.
17. At the end of the session, do not forget to fill in the **End time** and check the form for missing values before handing it in.
18. Compliance to hand hygiene may be quickly calculated for each professional category by form and session:

$$Compliance\ (\%) = \frac{realised\ actions}{opportunities} * 100$$

2

Observation Tool 3 – Ontario Observation Tool

Observation Tool

Ontario

Observer-ID: |__|__|__|__|

Date (mm.dd.yyyy) |__|__|.|__|__|.|__|__|__|__|

Day of Week _____

Start time (hh:mm:AM/PM) |__|__|:|__|__|:|__|

End time (hh:mm) |__|__|:|__|__|

Form-No. |__|__|

Facility-ID |__|__|__|

Patient Care Unit _____

Health care worker (HCW) category:

1 = Physician	6 = Pastoral Care	11 = Radiology Tech
2 = Nurse	7 = IV Team/Blood Collection	12 = Respiratory Therapist
3 = Medical Student	8= Physiotherapist	13 = Dietician
4 = Nursing Student	9 = Environmental Services Worker	14 = PSA, PSW, PCA
5 = Social Worker	10 = Patient Transporter	15 = Other

HCW: _____	HCW: _____	HCW: _____	HCW: _____
1 ☐ BEF-PAT T: ☐ AFT-PAT T:	1 ☐ BEF-PAT T: ☐ AFT-PAT T:	1 ☐ BEF-PAT T: ☐ AFT-PAT T:	1 ☐ BEF-PAT T: ☐ AFT-PAT T:
☐ BEF-ASP ☐ AFT-BFL	☐ BEF-ASP ☐ AFT-BFL	☐ BEF-ASP ☐ AFT-BFL	☐ BEF-ASP ☐ AFT-BFL
☐ BEF-ENV ☐ AFT-ENV	☐ BEF-ENV ☐ AFT-ENV	☐ BEF-ENV ☐ AFT-ENV	☐ BEF-ENV ☐ AFT-ENV
☐ Rub ☐ Wash ○ Missed	☐ Rub ☐ Wash ○ Missed	☐ Rub ☐ Wash ○ Missed	☐ Rub ☐ Wash ○ Missed
☐ Gloves ☐ Nails	☐ Gloves ☐ Nails	☐ Gloves ☐ Nails	☐ Gloves ☐ Nails
☐ Bracelets ☐ Rings	☐ Bracelets ☐ Rings	☐ Bracelets ☐ Rings	☐ Bracelets ☐ Rings
2 ☐ BEF-PAT T: ☐ AFT-PAT T:	2 ☐ BEF-PAT T: ☐ AFT-PAT T:	2 ☐ BEF-PAT T: ☐ AFT-PAT T:	2 ☐ BEF-PAT T: ☐ AFT-PAT T:
☐ BEF-ASP ☐ AFT-BFL	☐ BEF-ASP ☐ AFT-BFL	☐ BEF-ASP ☐ AFT-BFL	☐ BEF-ASP ☐ AFT-BFL
☐ BEF-ENV ☐ AFT-ENV	☐ BEF-ENV ☐ AFT-ENV	☐ BEF-ENV ☐ AFT-ENV	☐ BEF-ENV ☐ AFT-ENV
☐ Rub ☐ Wash ○ Missed	☐ Rub ☐ Wash ○ Missed	☐ Rub ☐ Wash ○ Missed	☐ Rub ☐ Wash ○ Missed
☐ Gloves	☐ Gloves	☐ Gloves	☐ Gloves
3 ☐ BEF-PAT T: ☐ AFT-PAT T:	3 ☐ BEF-PAT T: ☐ AFT-PAT T:	3 ☐ BEF-PAT T: ☐ AFT-PAT T:	3 ☐ BEF-PAT T: ☐ AFT-PAT T:
☐ BEF-ASP ☐ AFT-BFL	☐ BEF-ASP ☐ AFT-BFL	☐ BEF-ASP ☐ AFT-BFL	☐ BEF-ASP ☐ AFT-BFL
☐ BEF-ENV ☐ AFT-ENV	☐ BEF-ENV ☐ AFT-ENV	☐ BEF-ENV ☐ AFT-ENV	☐ BEF-ENV ☐ AFT-ENV
☐ Rub ☐ Wash ○ Missed	☐ Rub ☐ Wash ○ Missed	☐ Rub ☐ Wash ○ Missed	☐ Rub ☐ Wash ○ Missed
☐ Gloves	☐ Gloves	☐ Gloves	☐ Gloves
4 ☐ BEF-PAT T: ☐ AFT-PAT T:	4 ☐ BEF-PAT T: ☐ AFT-PAT T:	4 ☐ BEF-PAT T: ☐ AFT-PAT T:	4 ☐ BEF-PAT T: ☐ AFT-PAT T:
☐ BEF-ASP ☐ AFT-BFL	☐ BEF-ASP ☐ AFT-BFL	☐ BEF-ASP ☐ AFT-BFL	☐ BEF-ASP ☐ AFT-BFL
☐ BEF-ENV ☐ AFT-ENV	☐ BEF-ENV ☐ AFT-ENV	☐ BEF-ENV ☐ AFT-ENV	☐ BEF-ENV ☐ AFT-ENV
☐ Rub ☐ Wash ○ Missed	☐ Rub ☐ Wash ○ Missed	☐ Rub ☐ Wash ○ Missed	☐ Rub ☐ Wash ○ Missed
☐ Gloves	☐ Gloves	☐ Gloves	☐ Gloves

Comments:

Note: If patient is on **additional precautions/isolated** indicate "HCW category number" and "Opportunity number " in the "Comments".

Observation guide

1. Determine how to best identify the types of health care workers you may be observing.
2. Identify an area in the unit where you can comfortably observe health care workers.
3. Position yourself so that you do not cause an obstruction but can still see what is happening. It may feel strange and you might think that you are too noticeable. This is normal and the best thing is to just carry on. You may also move to follow the health care workers discreetly.
4. It is important to take into account any concerns the health care workers may have with your presence. Your presence should be as discreet as possible and in no way infringe on the actions of the health care worker. If a health care worker feels uncomfortable with your presence he/she has the right to ask you to leave and you must do so if asked.
5. Use a pencil to fill in the form and an eraser to correct.
6. One observation session is for 20 minutes (+/- 10 minutes); prolong the session if you get the chance to observe a care sequence to its end. Otherwise, terminate it at 20 min. even if care activity is not complete. One session may involve observing more than one health care worker (see below).
7. If asked introduce yourself to the observed health care worker(s) and explain your role.
8. You may observe up to 3 healthcare workers simultaneously provided you are an experienced observer and are very careful not to miss opportunities. **Note**: Multiple health care workers performing sequential tasks quickly may preclude accuracy of missed hand hygiene opportunities.
9. First, fill in the head of the form by indicating your id number (Observer-ID), the date, the current time including am/pm (Start time), the number of the form used for a single session using the format 1, 2, 3 etc. (Form-No.) (see also point 19), the identity of the facility (Facility-ID), the identity of the patient care unit (Patient Care Unit) C
10. Indicate any rooms where Additional/Isolation Precautions are in place by entering in the Comments section. (Observe outside the room)
11. Indicate the type of health care worker being observed by entering the number that corresponds with the categories listed at the top of the form. The coding system is a number followed by a letter (e.g. first physician in the room is 1A, if second physician enters the room he/she is 1B).
12. Each column is for recording hand hygiene opportunities of **one** health care worker only. Use additional columns for each additional health care worker being observed simultaneously or sequentially. The health care worker may interact with more than one patient during the time you are observing.
13. As soon as you observe the first opportunity for hand hygiene, indicate the corresponding information in the first of the numbered opportunity sections in the column corresponding to the health care provider being observed.
14. For each opportunity indicate one the following indications for hand hygiene:
    - **BEF-PAT** = "*before patient*"
        - **a)** if the health care worker touches the patient's environment and then touches the patient **or**
        - **b)** goes directly to touch the patient

      after having touched the hospital environment (= any other surface not in the patient's environment) or another patient's environment
    - **BEF-ENV** = "*before patient environment contact*" if the health care worker enters the patient's environment from the hospital environment and touches <u>only</u> the patient's environment (does not touch patient) and then leaves the patient's environment
    - **AFT-PAT** = "*after patient contact*" if the health care worker is leaving the patient and his/her environment to go on working in the hospital environment or with another patient
    - **AFT-ENV** = "*after environment exposure*" if the healthcare worker is leaving the patient area after touching objects in the patient environment (without touching the patient) to go on working in the hospital environment or with another patient.
    - **BEF-ASP** = "*before aseptic procedure*" if the health care worker is to perform any of the following after having touched any other surface including the concerned patient himself/herself and his/her environment:
        - a) touch/manipulate a body site that should be protected against any colonization (e.g. wound care including dressing change and wound assessment)
        - b) manipulate an invasive device that could result in colonisation of a body compartment that should be protected against colonisation (e.g. priming intravenous infusion set, inserting insertions spike into opening of IV bag, flushing line, adjusting intravenous site, administering medication through IV port, changing IV tubing)
    - **AFT-BFL** = "*after body fluid exposure*" if the healthcare worker has been engaged in a care activity involving a risk of body fluid exposure and before touching any other surface including the concerned patient himself/herself and his/her environment (e.g. contact with blood or blood products, emptying urinal/catheter bag and suctioning oral/nasal secretions).

    Note:
    - If several indications fall together on the same hand hygiene opportunity, tick all.
    - For each opportunity tick whether or not the health care worker was wearing gloves (**Gloves**) when the opportunity occurred.
15. Timing of the duration of hand hygiene:

    T = "*timing*" this is the duration of hand hygiene performed by the health care worker when hand hygiene occurs after BEF-PAT and AFT-PAT opportunities. Begin timing, with a wrist watch or stop watch, when the HCW starts rubbing his/her hands with the product, and stop timing when he/she complete the motion of rubbing his/her hands with the product. Record the time in seconds.
16. Next, tick alternatively, either the hand hygiene action (**Rub** or **Wash** or both) or the missing action (**Missing**) as occurring for this hand hygiene opportunity. Note: If hand hygiene is done with gloves on after a hand hygiene opportunity it is marked as a missed opportunity.
17. Next tick the corresponding boxes (**Rings, Bracelets, Nails**) if the health care worker does not meet the guidelines regarding: correct nail length, absence of nail extensions/artificial nails and absence of rings or bracelets. It is necessary to do this only once for each health care worker.
18. End the observation if the privacy curtain is drawn around the patient's bed.
19. If you observe more than 4 opportunities for one health care worker, use another form numbering them sequentially in the variable **Form-No**.
20. At the end of the session, do not forget to fill in the **End time** and check the form for missing values before handing it in. Record any additional qualitative data in the 'Comments' section. Comments should include any logistical and facilitating factors encountered in measuring compliance through observational methods.

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Observation Tool 4 – England and Wales National Patient Safety Agency (NPSA) Hand Hygiene Observation Tool (HHOT)

Name: Session no..... Sheet no.....

	Before low risk contact	After low risk contact	Before high risk contact	After high risk contact	Before unobserved contact	After unobserved contact
Doctor						
Opp.						
Soap						
Alcohol						
No action						
Unknown						
Nurse/HCA						
Opp.						
Soap						
Alcohol						
No action						
Unknown						
Other/Unsure						
Opp.						
Soap						
Alcohol						
No action						
Unknown						

Hospital: Ward: Date: Start time: End time:

Patients observed: No. of soap dispensers: No. of alcohol dispensers:

Observation Tool

UCL

2. Summary of how to use the HHOT

1. Define your **"field of view"** at the start of the observation session. This should include the patient care area to be observed (e.g. three or four beds) and observable points at which HCWs caring for those patients could clean their hands (e.g. nearby sinks with soap, nearby alcohol rub dispensers). Hand hygiene taking place outside of this area, and therefore not seen, is assumed not to have taken place.

2. The HHOT records **hand-hygiene opportunities, hand-hygiene behaviours** and the type of **Healthcare Worker.** Use the HHOT sheet (see section 6, page 13).

3. **Hand-hygiene opportunities** during patient care occur
   i. before patient contact
   ii. after patient contact
   iii. after contact with the patient's environment (i.e. space within curtains or patient's side room)

4. **Hand-hygiene opportunities** are classified as
   i. high risk (mucosa, body fluids, manipulating an indwelling device)
   ii. low risk (all other patient contact; contact with patient's environment)
   iii. unobserved level of risk (direct contact behind curtains)

5. **Hand-hygiene behaviours** are classified as
   i. alcohol handrub (AHR) (use of AHR)
   ii. soap and water (use of soap and water)
   iii. no action (clearly observed to do neither)
   iv. unknown (No hand-hygiene behaviour seen before/after unobserved opportunity & AHR is behind curtains.)

6. **Health Care Workers** are classified as i. doctors
   ii. nurses (including healthcare assistants)
   iii. other/unsure (all others)

7. **"Before"** a hand-hygiene opportunity is defined as:
   The point at which an opportunity begins during a patient contact episode.
   "After" a hand-hygiene opportunity is defined as:
   The period immediately after a break in a contact episode.

8. **A break in a patient contact episode** includes:
   i. any contact with another patient (observed or unobserved)
   ii. moving from a "low risk" contact to a 'high risk' contact in the same patient, & vice versa
   iii. moving from a "high risk" contact to another "high risk" in the same patient
   iv. moving out of observers field of view. (i.e. around corner).
   NB: healthcare workers moving from one low risk contact to another on the same patient are not classified as having a break in patient contact between each low risk opportunity

9. **Avoid "double counting":** Hand hygiene opportunities should not be double counted. If a HCW is observed moving directly from one hand hygiene opportunity to another, without any intervening opportunities this should be classified as one 'after" opportunity and not as an "after" and as a "before" opportunity.

10. **Overall compliance (%):** $\frac{\text{Number of soap \& AHR behaviours}}{\text{Total hand-hygiene opportunities} - \text{number of unknown behaviours}} \times 100$

2

Observation Tool

UCL

1. Before and after a low risk opportunity

Definitions

A low risk hand hygiene opportunity occurs:

1. **Before and after a low risk patient contact**:
   Any contact of HCWs hand (gloved or ungloved) with patients skin/clothing providing that skin is intact/covered with an impermeable dressing, there is no contamination with body fluids and there is no manipulation of an invasive device (see examples).

   Examples:
   - Vital signs (blood pressure, temperature, HR, RR)
   - Mobilisation
   - Patient cleansing
   - Other skin contacts and skin preparation
   - Medical examination without invasive procedures
   - Touching patients catheter bag *without* breaking the system

2. **After an environmental contact**
   Any contact of HCWs hand (gloved or ungloved) with patients immediate environment i.e. within patients curtains/sideroom.

   Examples: Patient's bed, cotsides, bedsheets, bedside table, locker, walking frame, patient equipment.

A hand hygiene opportunity does *not* occur:

- When there is no patient contact (**even if** hand cleaning is observed)
- Before an environmental contact

"Before" is defined as the point at which the low risk opportunity commences during a patient contact episode.

"After" is defined as the period immediately after a break in a contact episode.

A **break in a contact episode** occurs:
- when moving to any contact with another patient (observed or unobserved)
- when moving to an observed 'high risk' contact in the same patient
- when moving out of observers field of view. i.e. around corner.

5

Observation Tool

UCL

II. Before and after a high risk opportunity

Definitions

A high risk opportunity occurs:

Before and after

- Contact with wounds/mucosa
  (uncovered skin breaks, nose, eyes, mouth including dentures)
- Contact with body fluids (on patient or in environment)
  (urine,faeces, blood or serous fluid, sputum, pus)
- Manipulation of invasive device
  (urinary catheter; intravenous catheters; PEG or NG feeding tubes; oral, nasal or tracheostomy respiratory tubes; injections or blood samples im,iv or sc)

An **invasive device** is defined as any foreign body which breaks the skin barrier/enters clean or sterile cavities.

Manipulation of an invasive device is defined as any activity which breaks a closed system. Do not include simple contact with the device which does not break the system.

Examples:

i. Initial insertion of indwelling device i.e. catheter, IV cannulae
ii. Any subsequent breaking of the system i.e.
   1) Taking samples via a port or skin, emptying stoma/catheter bags
   2) Introducing substances into a sterile cavity via a port or skin, (drugs, flushes, feed)
   3) Disconnecting patient from invasive device
iii. Changing dressings at entry site/touching entry site
iv. Removal of invasive device

"Before" is defined as the point at which the high risk opportunity commences during a patient contact episode.

"After" is defined as the period immediately after a break in a contact episode.

A **"break in a contact episode"** occurs:

- when moving to a low risk contact with the patient or their immediate environment
- when moving on to any contact with another patient or their immediate environment
- when moving to a another 'high risk' contact in the same patient.
- when moving out of observers field of view. i.e. around corner.

6

Reedsburg Area Medical Center
Organization Focused

HAND HYGIENE OBSERVATION TOOL

Date/Time: _____ Unit: _____ Observer's Name: _____

1	2	3	4	5	6	7
Job Category Observed	Task Observed	Hand Hygiene Not Done	Product Used	Procedure Followed Correctly	Soap & Water Used **Incorrectly** (Check **all** that apply)	Alcohol Product Used **Incorrectly** (Check **all** that apply)
	❑ Before patient contact ❑ After patient contact ❑ After removing gloves ❑ Hand hygiene demonstration	☐ STOP Intervened: ☐Yes ☐No	Soap & H_2O ☐ Alcohol Gel ☐ **Continue →**	☐Yes STOP ☐ No **Continue →**	❑ No soap used ❑ No soap available ❑ < 15 second wash ❑ Bare hands to turn off faucet ❑ No paper towels available	❑ Not enough product used ❑ Not spread into hands ❑ Wiped off ❑ Hands rinsed or washed after applied ❑ No product available
	❑ Before patient contact ❑ After patient contact ❑ After removing gloves ❑ Hand hygiene demonstration	☐ STOP Intervened: ☐Yes ☐No	Soap & H_2O ☐ Alcohol Gel ☐ **Continue →**	☐Yes STOP ☐ No **Continue →**	❑ No soap used ❑ No soap available ❑ < 15 second wash ❑ Bare hands to turn off faucet ❑ No paper towels available	❑ Not enough product used ❑ Not spread into hands ❑ Wiped off ❑ Hands rinsed or washed after applied ❑ No product available
	❑ Before patient contact ❑ After patient contact ❑ After removing gloves ❑ Hand hygiene demonstration	☐ STOP Intervened: ☐Yes ☐No	Soap & H_2O ☐ Alcohol Gel ☐ **Continue →**	☐Yes STOP ☐ No **Continue →**	❑ No soap used ❑ No soap available ❑ < 15 second wash ❑ Bare hands to turn off faucet ❑ No paper towels available	❑ Not enough product used ❑ Not spread into hands ❑ Wiped off ❑ Hands rinsed or washed after applied ❑ No product available
	❑ Before patient contact ❑ After patient contact ❑ After removing gloves ❑ Hand hygiene demonstration	☐ STOP Intervened: ☐Yes ☐No	Soap & H_2O ☐ Alcohol Gel ☐ **Continue →**	☐Yes STOP ☐ No **Continue →**	❑ No soap used ❑ No soap available ❑ < 15 second wash ❑ Bare hands to turn off faucet ❑ No paper towels available	❑ Not enough product used ❑ Not spread into hands ❑ Wiped off ❑ Hands rinsed or washed after applied ❑ No product available

Comments:

Observation Tool 5 – Reedsburg Area Medical Center Obs. Tool

REEDSBURG AREA MEDICAL CENTER
Organization Focused
HAND HYGIENE OBSERVATION TOOL
Page 2 of 2

DEFINITIONS:

Procedure for Soap and Water (Required):
(If hands visibly soiled after using bathroom or before eating)
- Use enough soap to create lather
- Scrub for 15 seconds of friction
- Rinse
- Dry
- Turn off faucets with paper towels

Procedure for Alcohol Product:
- Enough product used (dime or nickel size)
- Thoroughly rub product on all surfaces of hands and wrists
- Continue rubbing until dry
- Do not wipe off
- Hands not rinsed or washed after application

Direction for Using Form:
1. Observe performance.
2. Intervene, if possible, and educate on work practice.
3. Continue observation.
4. Use one form for each person involved.
5. Record the results of your observation in the tables.
6. Record comments as needed.
7. Do your best at determining job category of individual observed.

M.D.
Nurse Practitioner
RN
LPN
CNA
Laboratory
Radiology (X-ray)
Physical Therapy (PT)
Occupational Therapy (OT)
Respiratory Therapist
Housekeeping
Pharmacist
Med Student
Nursing Student
Other Student
Maintenance
Business Office
Volunteer
Dietary (Dietary staff are trained to touch only the food items (containers) they deliver to patient rooms. They do not touch the patient or any item in patient rooms, therefore, no hand hygiene is required unless they touch the patient or non-food items in the patient's room.)

- **Hyperlinks to:**
  - Hand Hygiene Protocol—Organization Focused Manual—(IC)
  - Hand Hygiene Training/Demonstration—Organization Focused Manual—(IC)

APPROVAL: 9/04
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DISTRIBUTION: Organization Focused Manual—Improving Organization Performance (PI)

kjk \ Hand Hygiene Observation Tool

Observation Tool 6 – Mayo Clinic Hand Hygiene and Glove Use Monitoring Form

HAND HYGIENE AND GLOVE USE MONITORING FORM

Unit/Dept.: _____ **Day of Week:** _____ **Date:** ____/____/____ **Time:** ___:___AM/PM to ___:___AM/PM **Initials** _____

	Type of healthcare worker (circle only one)	Type of contact: Patient	Type of contact: Environment	Requires gloves	Hand hygiene before	Gloves worn	Hand hygiene after	Adherence: Hand hygiene	Adherence: Gloves	Adherence: Overall
1	D N TH PH XR ES TR OT	Y N	Y N	Y N	Alc HW N	Y N	Alc HW N	Y N	Y N NA	Y N
2	D N TH PH XR ES TR OT	Y N	Y N	Y N	Alc HW N	Y N	Alc HW N	Y N	Y N NA	Y N
3	D N TH PH XR ES TR OT	Y N	Y N	Y N	Alc HW N	Y N	Alc HW N	Y N	Y N NA	Y N
4	D N TH PH XR ES TR OT	Y N	Y N	Y N	Alc HW N	Y N	Alc HW N	Y N	Y N NA	Y N
5	D N TH PH XR ES TR OT	Y N	Y N	Y N	Alc HW N	Y N	Alc HW N	Y N	Y N NA	Y N
6	D N TH PH XR ES TR OT	Y N	Y N	Y N	Alc HW N	Y N	Alc HW N	Y N	Y N NA	Y N
7	D N TH PH XR ES TR OT	Y N	Y N	Y N	Alc HW N	Y N	Alc HW N	Y N	Y N NA	Y N
8	D N TH PH XR ES TR OT	Y N	Y N	Y N	Alc HW N	Y N	Alc HW N	Y N	Y N NA	Y N
9	D N TH PH XR ES TR OT	Y N	Y N	Y N	Alc HW N	Y N	Alc HW N	Y N	Y N NA	Y N
10	D N TH PH XR ES TR OT	Y N	Y N	Y N	Alc HW N	Y N	Alc HW N	Y N	Y N NA	Y N
11	D N TH PH XR ES TR OT	Y N	Y N	Y N	Alc HW N	Y N	Alc HW N	Y N	Y N NA	Y N
12	D N TH PH XR ES TR OT	Y N	Y N	Y N	Alc HW N	Y N	Alc HW N	Y N	Y N NA	Y N
13	D N TH PH XR ES TR OT	Y N	Y N	Y N	Alc HW N	Y N	Alc HW N	Y N	Y N NA	Y N
14	D N TH PH XR ES TR OT	Y N	Y N	Y N	Alc HW N	Y N	Alc HW N	Y N	Y N NA	Y N
15	D N TH PH XR ES TR OT	Y N	Y N	Y N	Alc HW N	Y N	Alc HW N	Y N	Y N NA	Y N
16	D N TH PH XR ES TR OT	Y N	Y N	Y N	Alc HW N	Y N	Alc HW N	Y N	Y N NA	Y N
17	D N TH PH XR ES TR OT	Y N	Y N	Y N	Alc HW N	Y N	Alc HW N	Y N	Y N NA	Y N
18	D N TH PH XR ES TR OT	Y N	Y N	Y N	Alc HW N	Y N	Alc HW N	Y N	Y N NA	Y N
19	D N TH PH XR ES TR OT	Y N	Y N	Y N	Alc HW N	Y N	Alc HW N	Y N	Y N NA	Y N
20	D N TH PH XR ES TR OT	Y N	Y N	Y N	Alc HW N	Y N	Alc HW N	Y N	Y N NA	Y N
21	D N TH PH XR ES TR OT	Y N	Y N	Y N	Alc HW N	Y N	Alc HW N	Y N	Y N NA	Y N
22	D N TH PH XR ES TR OT	Y N	Y N	Y N	Alc HW N	Y N	Alc HW N	Y N	Y N NA	Y N
23	D N TH PH XR ES TR OT	Y N	Y N	Y N	Alc HW N	Y N	Alc HW N	Y N	Y N NA	Y N
24	D N TH PH XR ES TR OT	Y N	Y N	Y N	Alc HW N	Y N	Alc HW N	Y N	Y N NA	Y N
25	D N TH PH XR ES TR OT	Y N	Y N	Y N	Alc HW N	Y N	Alc HW N	Y N	Y N NA	Y N
26	D N TH PH XR ES TR OT	Y N	Y N	Y N	Alc HW N	Y N	Alc HW N	Y N	Y N NA	Y N
27	D N TH PH XR ES TR OT	Y N	Y N	Y N	Alc HW N	Y N	Alc HW N	Y N	Y N NA	Y N
28	D N TH PH XR ES TR OT	Y N	Y N	Y N	Alc HW N	Y N	Alc HW N	Y N	Y N NA	Y N
29	D N TH PH XR ES TR OT	Y N	Y N	Y N	Alc HW N	Y N	Alc HW N	Y N	Y N NA	Y N
30	D N TH PH XR ES TR OT	Y N	Y N	Y N	Alc HW N	Y N	Alc HW N	Y N	Y N NA	Y N
							Total # of Y			
							% Adherence	%	%	%

Type of healthcare worker: **D** = attending, fellow, resident, PA, med stud; **N** = nurse, aide, **TH** = therapist (RT, PT, OT); **PH** = phlebotomy/IV team; **XR** = radiology technician; **ES** = environmental services; **TR** = transporter; **OT** = other

Hand hygiene before/after: Alc = alcohol rub; HW = handwashing with soap and water; N = none

Requires gloves: Y if Contact, Droplet, or Strict Isolation <u>or</u> contact involves invasive procedure or blood or body fluids, secretions/excretions, mucous membranes, non-intact skin; N if not

Adherence: Hand hygiene -- Y if patient contact and hand hygiene before and after both Y, gloves worn and hand hygiene after both Y, or environmental contact only and hand hygiene after Y; N = if not

Gloves -- Y if Requires gloves Y and Gloves worn Y; N if Requires glove Y and Gloves Worn N; NA if Requires gloves N **Overall adherence** -- Y if hand hygiene Y and Gloves Y or NA; N if not

HAND HYGIENE AND GLOVE USE MONITORING FORM

Instructions:

1. Each row should be used to record an encounter between one healthcare worker (HCW) and one patient that involves touching by the HCW of the patient or the patient's immediate environment. Encounters that do not involve touching (i.e., only verbal communication between the HCW and the patient) should not be recorded.
2. An encounter may involve patient contact, environmental contact or both.
3. For the purposes of this measurement exercise, an encounter begins when a healthcare worker enters the patient's room or approaches the patient's bedside (for multibed rooms) and ends when the healthcare worker leaves the room or bedside. In a situation where a patient requires extended or complicated care (such as in an ICU), an encounter may involve multiple contacts and it may be appropriate to record these individually if they are distinct activities. For example, a nurse may perform multiple patient care tasks at the bedside, complete this care, and then begin a series of contacts with the patient's environment. To the extent that the patient care and environmental contacts can be observed and distinguished clearly, they may be recorded separately.
4. The observer should be aware of whether a patient is on Contact, Droplet, or Strict Isolation. Gloves are required for all of these types of isolation precautions. This information is necessary to determine whether gloves are required (see below).
5. For patient contact, the observer should be aware of the nature of the contact. This information is necessary to determine whether gloves are required (see below). It is important to distinguish three general subtypes of patient contact listed below (gloves are required for 5.a and 5.b but not for 5c):
   a. contact that involves performing an invasive procedure (i.e., inserting an intravascular catheter or indwelling urinary catheter);
   b. contact that involves actual or potential contact with blood, body fluids, secretions (except sweat), excretions, mucous membranes or non-intact skin (i.e., suctioning an intubated patient, emptying a urinal or bedpan, changing an dressing on an open wound);
   c. other patient contact that does not qualify for a or b (i.e., measuring vital signs, examining a patient, repositioning a patient, etc.).
6. Use the following codes to record data on the monitoring form (Note: Y = Yes, N = No, unless otherwise noted):

   Type of Healthcare Worker: D = attending physician, fellow, resident, physician's assistant, medical student; N = nurse, aide, TH = therapist (respiratory therapist, physical therapist, occupational therapist); PH = phlebotomy/IV team; XR = radiology technician; ES = environmental services; TR = transporter; OT = other;

   Type of contact: *Patient contact* involves touching the patient's body, gown, or clothes. *Environmental contact* involves touching the patient's bed or bed linen, bedside equipment, or other equipment, supplies, articles, or surfaces in the patient's bedspace or room.

   Requires gloves: Y = patient is on Contact, Droplet, or Strict Isolation or Type of contact (see # 5) is Y for Patient and contact can be seen to involve an invasive procedure or contact with blood, body fluids, secretions/excretions, mucous membranes, or non-intact skin; N = not.

   Hand hygiene before/after: Alc = alcohol rub; HW = handwashing with soap and water; N = none;

   Gloves worn: record Y or N based on observed use of gloves.
7. In the Adherence section, use the following rules to record Y or N for Hand Hygiene, Glove Use, and Overall Adherence:

   Hand hygiene: Y if the Type of Contact was patient contact and Hand hygiene before and after are both Y, Gloves worn is Y and Hand hygiene after is Y, or if the Type of Contact was Environment only and Hand hygiene after is Y; N = if not;

   Glove use: Y if Gloves required and Gloves worn are both Y; N if Gloves required is Y and Gloves worn is N; NA if Gloves Required is N;

   Overall: Y if Hand hygiene is Y and Glove Use is Y or NA; N if not.
8. In the Adherence section: Totals for the columns, count the number of Y for Hand hygiene, Glove use, and Overall, record in box at the bottom of each column.
9. In the Adherence section, calculate the percent adherence using the formulas below and record the percent in the box at the bottom of each column

   Hand hygiene: Total # of Y ÷ Total # of Encounters (number of rows with data recorded) x 100;

   Glove use: Total # of Y ÷ [Total # of Encounters (number of rows with data recorded) – Total # of NA] x 100;

   Overall: Total # of Y ÷ Total # of Encounters (number of rows with data recorded) x 100.

Appendix 14

OVERT OBSERVATIONAL INSTRUCTIONS AND TOOL

Format

Monitoring adherence with hand hygiene and providing staff with feedback on their performance is strongly recommended in recent literature. There are a range of tools available for assisting staff in calculating hand hygiene compliance and a number are currently under development. The tool which is made available here was used in an UK campaign and will allow you to collect some baseline information on compliance in your organisation.

Nurse Unit Managers, Facility Directors of Nursing or Nurse Managers are advised to identify staff on the ward who will undertake observations. This could be an infection control link practitioner. You will need to arrange for staff to be briefed on the practicalities of observation, using the tools here as a guide.

The hand hygiene observation tool is designed to assist staff in observing hand hygiene behaviour and allows for meaningful feedback to staff on the wards.

It is based on a tool used in one of the largest studies undertaken internationally on hand hygiene which demonstrated that feedback was a key feature of improvement.

The basis of the tool is that it allows you to record over a *20-minute* period whether healthcare workers who touch patients have adequately decontaminated their hands before and after patient care and note whether the opportunity was high, medium or low risk.

The model used here is a modified version of Pittet et al (2000) and used extensively internationally.

Hand hygiene opportunities

The chart provides examples of opportunities for high, medium and low risk. All hand hygiene opportunities should include hand washing or use of alcohol rub **before and after patient contact**.

The feedback form summaries the findings from the observational tool and compares hand hygiene opportunities (Opp) with actual observed hand hygiene (HH Obs). Compliance can then be expressed as a percentage.

Compliance can be defined as either washing hands with soap and water or rubbing with an alcohol rub in accordance with a hand hygiene opportunity, so

$$\text{Compliance} = \frac{\textbf{H}\text{and }\textbf{H}\text{ygiene }\textbf{Obs}\text{erved (HH Obs)}}{\text{hand hygiene }\textbf{opp}\text{ortunity (Opp)}} \times 100 = \text{compliance \%}$$

The methods used to observe HCW's hand hygiene compliance will be overt observations and will undoubtedly result in a 'Hawthorne Effect' and an additional hand hygiene learning opportunity. All observational periods will use this method comparing compliance rates with similar biases.

Instructions:

1. The staff member undertaking observation should undertake a number of practice observations to get familiar with the tool to reduce reporting bias.
2. Overt observation technique will be used by just one person or with a partner.
3. Identify an area within your ward/department where you can comfortably observe staff. Stay in this place for 20 minutes and observe your 'window' of activity. If staff walk away without you seeing whether they perform hand hygiene, you are to assume hand hygiene **has not** been undertaken.
4. Observe for **20-minute** periods.
5. Using the observation sheet tally hand hygiene **opp**ortunity and '**h**and **h**ygiene **obs**erved for **before and after patient care**. If hand hygiene does not take place leave it blank.
6. The observation sheet offers you the chance to identify opportunities as low, medium or high and if hand hygiene activity has taken place before and after patient contact.
7. When you have completed 20 minutes' observation, give feedback to the staff – a feedback form is included in this pack. When you give verbal feedback try to stress positive findings first and if you give negative feedback give examples and suggestions for improvement. Also, ask for feedback from the observed staff about why they did not comply – use this as a learning feedback opportunity.
8. Keep hold of the completed observations and hand to the nurse unit manager. Provide a copy of the completed observations and feedback form to your AHS Hand Hygiene Project Officer, which will be forwarded to the Clinical Excellence Commission. This data will be de-identified.
9. While you are observing you may identify issues which are barriers to hand hygiene, e.g. no soap, obstructed sinks, no alcohol hand rubs by the bed, alcohol hand rub dispensers not working, alcohol hand rub dispensers empty – include this in your feedback.
10. If you find activities which are not identified on the chart, add them and let the infection control team know.

Definitions: Fulkerson – Risk scale for hand hygiene opportunities

Low Risk

1. Sterile or autoclaved materials
2. Thoroughly cleaned or washed materials
3. Materials that are not necessarily cleaned but free from patient contact i.e. notes, papers, telephone and nurses desk area.
4. Materials in contact with patients with little contamination risk i.e. furniture in patient area

Medium risk

5. Objects or materials that have been in close contact with patients but are not contaminated with patient secretions or other sources of pathogenic bacteria i.e. relatively clean patient gowns, linen, used cutlery or plates, bed rails and tops of patient tables.
6. A patient: minimal contact without touching excretions or secretions and for a limited period of time such as shaking hands, taking a pulse or giving a back rub.
7. Materials and inanimate objects that have been in contact with, or bear, patient secretions such as saliva, not known to be contaminated.
8. Setting up and removing IVI and giving injections (eg, subcutaneous, intramuscular and intravenous injections)

High risk

9. A patient: directly touching areas of secretions such as mouth, nose and so forth.
10. Materials contaminated with patient urine
11. Patient urine (direct contact)
12. Materials bearing faecal soilage
13. Faecal soilage (direct contact)
14. Materials that have been in direct contact with known infected secretions or excretions
15. Secretions or excretions known to be contaminated (direct contact)
16. Handling urine, faeces, blood (eg, bed pans, commodes, catheter bags)
17. Insertion and removal of IV cannulas
18. Infected patient sites such as infected wounds (direct contact)

References:

Pittet et al 2000: Effectiveness of hospital wide programme to improve compliance with hand hygiene. *Lancet* 356: 1307-12

Meengs et al 1994: Handwashing frequency in an emergency department. *Annals of Emergency medicine* 23 (6) 1307-12

Hand Hygiene Observation Tool – Feedback form

Date	
Time	
Ward/Unit	
Observer/s	
Score: Hand Hygiene Observed (HH Obs) x100 Hand Hygiene Opportunities (Opp)	
Score by staff group (if requested)	
Score compared to division/ unit/ directorate average	
Specific Feedback:	
Feedback Given to:	
Further action required:	
Comments	

Overt Observation Tool Facility: Location/Ward: Observer:

Date:	Nurses				Doctors				Allied Health				Other Staff		
Time:	Before		After		Before		After		Before		After		Before		After
Low Risk	Opp.	HH Obs	Opp.	HH Obs	Opp.	HH Obs	Opp.	HH Obs	Opp.	HH obs	Opp.	HH Obs	Opp.	HH Obs	Opp.
Touching sterile goods															
Making clean bed															
Contact with notes, telephone, computer															
Medication round															
Other															
Low Risk Tally Total															
Medium Risk															
Stripping a non-soiled bed															
Patient contact (hand shake)															
Manipulating medical devices in immediate patient environment															
Helping to move patient in/out of bed															
Cleaning beds, furniture															
Observations (TPR & BP)															
Setting up & removing IVI, giving injections															
Donning and removing gloves															
Bed bath, washing patient															
Other															
Medium Risk Tally Total															
High Risk															
Dealing with bodily secretions (urine, faeces, blood) eg catheter bags															
Suctioning, tracheostomy care															
Wound dressings															
Phlebotomy, cannulation															
Between procedures on same patient															
Attending MRO patient															
Other															
High Risk Tally Total															

Knowledge and
Attitude Surveys Tool 8 – WHO Hand Hygiene Knowledge Test
for Healthcare Workers

WORLD ALLIANCE
for PATIENT SAFETY

World Health Organization

ANNEX 35

SITE ID:

Hand hygiene knowledge test for health-care workers

The knowledge required for this test is specifically transmitted through the WHO hand hygiene training material and you may find the questions more difficult if you did not participate in this training.

Tick **only one answer** to each question.

Please read the questions carefully before answering. Your answers will be kept confidential.

SHORT GLOSSARY:

Alcohol-based handrub formulation: an alcohol-containing preparation (liquid, gel or foam) designed for application to the hands to kill germs;

Handrubbing: treatment of hands with an antiseptic handrub (alcohol-based formulation).

Handwashing: washing hands with plain or antimicrobial soap and water.

1. Personal ID: _____
2. Date: _____
3. Hospital: _____
4. Ward: _____
5. Service: _____
6. City: _____
7. Country: _____
8. Nature of hospital: O Public O Private
9. Type of hospital: O General O Teaching O District O Acute care O Long-term care
10. Gender: O Female O Male
11. Age: _____ years
12. Profession*: O Nurse O Auxiliary nurse O Midwife O Medical doctor O Technician O Therapist O Other

* **Students** must be included among nurse/midwife or medical doctor, according to the different professions
Technicians: radiologist, cardiology technician, operating room technician, laboratory technician
Therapist: physiotherapist, occupational therapist, audiologist, speech therapist
Others: dieticians, dentist, social worker

January 2007

13. Department (please select one department which is closest to yours):

O Internal medicine	O Surgery	O Intensive care unit	O Mixed medical/surgical
O Emergency unit	O Obstetrics	O Paediatrics	O Long-term/rehabilitation
O Outpatient clinic	O Other		

14. Did you receive a formal training in hand hygiene? O Yes O No

15. Is an alcohol-based handrub readily available at your institution? O Yes O No

16. Which of the following is the main route of cross-transmission of potentially harmful germs between patients in a health-care setting? ***(tick one answer only)***

a. O HCWs' hands when not clean
b. O Air circulating in the hospital
c. O Patients' exposure to colonised surfaces (i.e., beds, chairs, tables, floors)
d. O Sharing non-invasive objects (i.e., stethoscopes, pressure cuffs, etc.) between patients

17. What is the most frequent source of germs responsible for health care associated infections? ***(tick one answer only)***

a. O Germs in the hospital's water system
b. O Germs in the hospital air
c. O Germs already present on or within the patient
d. O Germs in the hospital environment (surfaces)

18. What is the minimal time needed for alcohol-based handrub to kill most germs on your hands? ***(tick one answer only)***

a. O 20 seconds b. O 3 seconds
c. O 1 minute d. O 10 seconds

19. Which of the following statements on the technique of hand hygiene with an alcohol-based handrub are "True"?

a. The handrub has to cover the entire surface of both hands	O True	O False
b. Hands have to be dry before care	O True	O False
c. You can dry your hands with a towel after handrubbing	O True	O False

20. Which of the following should be avoided as associated with a likelihood of hand colonisation?

a. Wearing jewellery	O Yes	O No
b. Damaged skin	O Yes	O No
c. Artificial fingernails	O Yes	O No
d. Regular use of a hand cream	O Yes	O No

21. Which type of hand hygiene method is required in the following situations?

a. Before writing in the patient record	O Rubbing	O Washing	O None
b. Before touching a patient	O Rubbing	O Washing	O None
c. When arriving on the ward after lunch	O Rubbing	O Washing	O None
d. Before giving an injection	O Rubbing	O Washing	O None
e. Before emptying a urinal	O Rubbing	O Washing	O None
f. Before opening a door to a patient room	O Rubbing	O Washing	O None

g.	After giving an injection	O Rubbing	O Washing	O None
h.	After emptying a bedpan	O Rubbing	O Washing	O None
i.	After removing protective gloves	O Rubbing	O Washing	O None
j.	When leaving the patient	O Rubbing	O Washing	O None
k.	After making a patient's bed	O Rubbing	O Washing	O None
l.	After visible exposure to blood	O Rubbing	O Washing	O None
m.	After touching a patient with diarrhoea	O Rubbing	O Washing	O None
n.	Before cleaning a bed after patient's departure	O Rubbing	O Washing	O None

22. Which of the following statements on alcohol-based handrub and handwashing with soap and water are true?

a.	Handrubbing is more rapid for hand cleansing than handwashing	O True	O False
b.	Handrubbing dries the skin more than handwashing	O True	O False
c.	Handrubbing is more effective against germs than handwashing	O True	O False

23. Which of the following hand hygiene actions prevents cross-transmission of germs to the patient?

a.	Hand hygiene before patient contact	O Yes	O No
b.	Hand hygiene after patient contact	O Yes	O No
c.	Hand hygiene immediately after a risk of body fluid exposure	O Yes	O No
d.	Hand hygiene after exposure to the immediate surroundings of a patient	O Yes	O No

24. Which of the following hand hygiene actions prevents infection of the patient by his or her own germs?

a.	Hand hygiene before patient contact	O Yes	O No
b.	Hand hygiene after patient contact	O Yes	O No
c.	Hand hygiene immediately after a risk of body fluid exposure	O Yes	O No
d.	Hand hygiene immediately before an aseptic procedure	O Yes	O No

25. Which of the following hand hygiene actions prevents infection of the health-care worker?

a.	Hand hygiene after patient contact	O Yes	O No
b.	Hand hygiene immediately after a risk of body fluid exposure	O Yes	O No
c.	Hand hygiene immediately before an aseptic procedure	O Yes	O No
d.	Hand hygiene after exposure to the immediate surroundings of a patient	O Yes	O No

26. Which of the following surfaces can contaminate your hands with germs that you might transmit to patients if you do not clean your hands before touching him/her ?

a.	Door handle of the patient's room	O Yes	O No
b.	The same patient's bed linen	O Yes	O No
c.	Another patient's intact skin	O Yes	O No
d.	The same patient's intact skin	O Yes	O No
e.	Patient medical record	O Yes	O No
f.	The walls in a patient's room	O Yes	O No
g.	Another patient's bedside table	O Yes	O No

Thank you very much for your time !

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Appendix 1. Hand Hygiene Knowledge Assessment Questionnaire

Use this questionnaire to periodically survey clinical staff about their knowledge of key elements of hand hygiene. Select 5 questions from this survey, or use other questions derived from your hospital's existing educational program. ***[NOTE: The correct answer for each question has been indicated below.]***

1. In which of the following situations should hand hygiene be performed? ***[Correct answer: #4]***

   A. Before having direct contact with a patient
   B. Before inserting an invasive device (e.g., intravascular catheter, foley catheter)
   C. When moving from a contaminated body site to a clean body site during an episode of patient care
   D. After having direct contact with a patient or with items in the immediate vicinity of the patient
   E. After removing gloves

Circle the number for the best answer:

1. B and E
2. A, B and D
3. B, D and E
4. All of the above

2. If hands are not visibly soiled or visibly contaminated with blood or other proteinaceous material, which of the following regimens is the most effective for reducing the number of pathogenic bacteria on the hands of personnel? ***[Correct answer: C]***

Circle the letter corresponding to the single best answer:

A. Washing hands with plain soap and water
B. Washing hands with an antimicrobial soap and water
C. Applying 1.5 ml to 3 ml of alcohol-based hand rub to the hands and rubbing hands together until they feel dry

3. How are antibiotic-resistant pathogens most frequently spread from one patient to another in health care settings? ***[Correct answer: C]***

Circle the letter corresponding to the single best answer:

A. Airborne spread resulting from patients coughing or sneezing
B. Patients coming in contact with contaminated equipment
C. From one patient to another via the contaminated hands of clinical staff
D. Poor environmental maintenance

How-to Guide: Improving Hand Hygiene
A Guide for Improving Practices among Health Care Workers

4. Which of the following infections can be potentially transmitted from patients to clinical staff if appropriate glove use and hand hygiene are not performed? ***[Correct answer: E]***

Circle the letter corresponding to the single best answer:

A. Herpes simplex virus infection
B. Colonization or infection with methicillin-resistant *Staphylococcus aureus*
C. Respiratory syncytial virus infection
D. Hepatitis B virus infection
E. All of the above

5. *Clostridium difficile* (the cause of antibiotic-associated diarrhea) is readily killed by alcohol-based hand hygiene products ***[Correct answer: False]***

__ True
__ False

6. Which of the following pathogens readily survive in the environment of the patient for days to weeks? ***[Correct answer: #3]***

A. *E. coli*
B. *Klebsiella spp.*
C. *Clostridium difficile* (the cause of antibiotic-associated diarrhea)
D. Methicillin-resistant *Staphyloccus aureus* (MRSA)
E. Vancomycin-resistant enterococcus (VRE)

Circle the number for the best answer:

1. A and D
2. A and B
3. C, D, E
4. All of the above

7. Which of the following statements about alcohol-based hand hygiene products is accurate? ***[Correct answer: C]***

Circle the letter corresponding to the single best answer:

A. They dry the skin more than repeated handwashing with soap and water
B. They cause more allergy and skin intolerance than chlorhexidine gluconate products
C. They cause stinging of the hands in some providers due to pre-existing skin irritation
D. They are effective even when the hands are visibly soiled
E. They kill bacteria less rapidly than chlorhexidine gluconate and other antiseptic containing soaps

Knowledge and Attitude Surveys Tool 10 –WHO Baseline Questionnaire of the Perception of Hand Hygiene and Healthcare-associated Infections

WORLD ALLIANCE *for* PATIENT SAFETY

World Health Organization

ANNEX 31

SITE ID:

Baseline Questionnaire on the *perception* of hand hygiene and health care-associated infections for *health-care workers*

You are in direct contact with patients on a daily basis and this is why we are interested in your **opinion** on health care-associated infections and hand hygiene.

- It should take you no more than 10 minutes to complete this questionnaire.
- Each question has **one answer only**.
- Please read the questions carefully and then respond spontaneously. Your answers are anonymous and will be kept confidential.
- SHORT GLOSSARY:

  Alcohol-based formulation: an alcohol-containing preparation (liquid, gel or foam) designed for application to the hands to kill germs.

  Handrubbing: treatment of hands with an antiseptic handrub (alcohol-based formulation).

  Handwashing: washing hands with plain or antimicrobial soap and water.

1. Date: _____
2. Hospital: _____
3. Ward: _____
4. Service: _____
5. City: _____
6. Country: _____
7. Nature of hospital: O Public O Private
8. Type of hospital: O General O Teaching O District O Acute care O Long-term care
9. Gender: O Female O Male
10. Age: _____ years
11. Profession*: O Nurse O Auxiliary nurse O Midwife O Medical doctor O Technician O Therapist O Other
12. Department (please, select the department which is closest to yours):

    O Internal medicine O Surgery O Intensive care unit
    O Mixed medical/surgical O Emergency unit O Obstetrics
    O Paediatrics O Long-term/rehabilitation O Outpatient clinic O Other

* **Students:** must be included among nurse/midwife or medical doctor, according to the different professions
Technicians: radiologist, cardiology technician, operating room technician, laboratory technician
Therapist: physiotherapist, occupational therapist, audiologist, speech therapist
Others: dielicians, dentist, social worker

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13. Did you receive formal training in hand hygiene? O Yes O No

14. Is an alcohol-based formulation available for hand hygiene at your institution? O Yes O No

15. What is the average percentage of hospitalised patients who will suffer from a health care-associated infection? |__|__|__| %

16. In general, what is the impact of a health care-associated infection on patient outcome?

O very low O low O high O very high

17. What is the effectiveness of hand hygiene in preventing health care-associated infection ?

O very low O low O high O very high

18. Among all patient safety issues, how important is hand hygiene for the directorate of your institution?

O low priority O moderate priority O high priority O very high priority

19. What is the average percentage of cases where health-care workers in your hospital really perform hand hygiene either by handrubbing or handwashing when recommended to do so (between 0 and 100%)? |__|__|__| %

20. In your opinion, how effective would the following actions be to increase hand hygiene permanently in your institution?

Please tick one "O" on the scale according to your opinion.

a. Leaders at your institution support and openly promote hand hygiene.
Not effective O---------O---------O---------O---------O---------O---------O Very effective

b. The health-care facility makes alcohol-based handrub available at each point of care.
Not effective O---------O---------O---------O---------O---------O---------O Very effective

c. Hand hygiene posters are displayed at point of care as reminders.
Not effective O---------O---------O---------O---------O---------O---------O Very effective

d. Each health-care worker is trained in hand hygiene.
Not effective O---------O---------O---------O---------O---------O---------O Very effective

e. Clear and simple instructions for hand hygiene are made visible for every health-care worker.
Not effective O---------O---------O---------O---------O---------O---------O Very effective

f. Health-care workers regularly receive the results of their hand hygiene performance.
Not effective O---------O---------O---------O---------O---------O---------O Very effective

g. You perform hand hygiene perfectly (being a good example for your colleagues).
Not effective O---------O---------O---------O---------O---------O---------O Very effective

h. Patients are invited to remind health-care workers to perform hand hygiene.
Not effective O---------O---------O---------O---------O---------O---------O Very effective

21. What importance does the head of your department attach to the fact that you perform optimal hand hygiene?

No importance O---------O---------O---------O---------O---------O---------O Very high importance

22. What importance do your colleagues attach to the fact that you perform optimal hand hygiene?

No importance O---------O---------O---------O---------O---------O---------O Very high importance

23. What importance do patients attach to the fact that you perform optimal hand hygiene?

No importance O----------O----------O----------O----------O----------O----------O Very high importance

24. How do you consider the effort required by you to perform good hand hygiene when caring for patients?

No effort O----------O----------O----------O----------O----------O----------O A big effort

25. What is the average percentage of cases where you perform hand hygiene either by handrubbing or handwashing when recommended to do so (between 0 and 100%)? |__|__|__| %

Thank you very much for your time !

Knowledge and Attitude Surveys Tool 11 – WHO Questionnaire on the Perceptions of Hand Hygiene and Healthcare-associated Infections for Senior Executive Managers

WORLD ALLIANCE for PATIENT SAFETY

World Health Organization

ANNEX 30

SITE ID:

Questionnaire on the *perception* of hand hygiene and health care-associated infections for *senior executive managers*

You are a member of your hospital's executive management team and this is why we are interested in your **opinion** on health care-associated infections and hand hygiene.

- It should take you no more than 10 minutes to complete this questionnaire.
- Each question has **one answer only**.
- Please read the questions carefully and then respond spontaneously. Your answers are anonymous and will be kept confidential.
- SHORT GLOSSARY:

  Alcohol-based formulation: an alcohol-containing preparation (liquid, gel or foam) designed for application to the hands to kill germs.

  Handrubbing: treatment of hands with an antiseptic handrub (alcohol-based formulation).

  Handwashing: washing hands with plain or antimicrobial soap and water.

1. Date: _____
2. Hospital: _____
3. City: _____
4. Country: _____
5. Nature of hospital: O Public O Private
6. Type of hospital: O General O Teaching O District O Acute care O Long-term care
7. Gender: O Female O Male
8. Time spent in the current position : _____ years
9. Time spent in present institution : _____ years
10. Current position: O Director O Head nurse O Head physician O Hospital administrator
11. Have you had any previous experience of a hand hygiene campaign? O Yes O No
12. Is an alcohol-based formulation available for hand hygiene at your institution? O Yes O No
13. What is the average percentage of patients hospitalised in your institution who will suffer from a health care-associated infection?

    |_|_|_| %
14. In general, what is the impact of a health care-associated infection on patient outcome?

    O very low O low O high O very high

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15. In general, what is the impact of a health care-associated infection on hospital expenditures?

O very low O low O high O very high

16. What is the effectiveness of hand hygiene in preventing health care-associated infection?

O very low O low O high O very high

17. Among all patient safety issues, how important is hand hygiene within your management priorities at your institution?

O low priority O moderate priority O high priority O very high priority

18. What is the percentage of cases where health-care workers in your hospital really perform hand hygiene either by handrubbing or handwashing when recommended to do so (between 0 and 100%) |__|__|__| %

19. Are senior nurses and doctors good examples for the promotion of hand hygiene at your institution?

Not at all O---------O---------O---------O---------O---------O---------O Very good

20. Is it common practice to inform patients about the importance of optimal hand hygiene during health-care delivery at your institution?

O Yes O No

21. How do you consider the effort required by health-care workers to perform good hand hygiene when caring for patients at your institution?

No effort O---------O---------O---------O---------O---------O---------O A big effort

22. How do health-care workers perceive your request to perform optimal hand hygiene during patient care at your institution ?

Not at all O---------O---------O---------O---------O---------O---------O Very much

23. In your opinion, how effective would the following actions be to increase hand hygiene compliance permanently in your institution?

Please tick one "O" on the scale according to your opinion.

a. Leaders and senior executive managers (you) at your institution support and openly promote hand hygiene.
Not effective O-------O-------O-------O-------O-------O-------O Very effective

b. The health-care facility makes alcohol-based formulation available at each point of care.
Not effective O-------O-------O-------O-------O-------O-------O Very effective

c. Hand hygiene posters are displayed at point of care as reminders.
Not effective O-------O-------O-------O-------O-------O-------O Very effective

d. Each health care worker is trained in hand hygiene.
Not effective O-------O-------O-------O-------O-------O-------O Very effective

e. Clear and simple instructions for hand hygiene are made visible for every healthcare worker.
Not effective O-------O-------O-------O-------O-------O-------O Very effective

f. Health-care workers regularly receive the results of their hand hygiene performance.
Not effective O-------O-------O-------O-------O-------O-------O Very effective

g. Senior nurses and doctors perform hand hygiene perfectly (being a good example for health-care workers at your institution)
Not effective O-------O-------O-------O-------O-------O-------O Very effective

h. Patients are invited to remind health-care workers to perform hand hygiene.
Not effective O-------O-------O-------O-------O-------O-------O Very effective

Thank you very much for your time !

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Knowledge and Attitude Surveys Tool 12 – Ontario Baseline Hand Hygiene Perception Survey

:ne Perception Survey – Health Care Providers

Baseline Hand Hygiene Perception Survey

Our hospital is planning to implement the Ontario *Just Clean Your Hands* Program. Our goal is to improve patient and health care provider safety by implementing a multifaceted approach that will support health care providers in performing hand hygiene at the right time. Our hospital is asking management and health care providers to complete surveys in order to learn more about hand hygiene in our facility. The surveys will be filled out before the program is introduced and then after the program has been implemented to assess changes in perception.

Please select only one answer for each question. It should take you approximately 10 minutes to complete this survey.

1. Facility Site: (optional) _____

2. Date: _____

3. Unit: _____

4. Department (please select the **one** department which is closest to yours):
   - ≤ Medicine
   - ≤ Surgery
   - ≤ Intensive care unit
   - ≤ Mixed medical/surgical
   - ≤ Emergency unit
   - ≤ Obstetrics
   - ≤ Newborn nursery
   - ≤ Paediatric
   - ≤ Diagnostic imaging
   - ≤ Dialysis
   - ≤ Outpatient clinic
   - ≤ Other

5. Position of person completing survey:
   - ≤ Physician
   - ≤ Nurse
   - ≤ Medical student
   - ≤ Nursing student
   - ≤ Social worker
   - ≤ Pastoral care
   - ≤ IV Team/blood collection
   - ≤ Physiotherapist
   - ≤ Environmental Services worker
   - ≤ Patient Transporter
   - ≤ Radiology tech
   - ≤ Respiratory therapist
   - ≤ Dietician
   - ≤ PSA, PSW, PCA
   - ≤ Other

6. Did you receive formal training in hand hygiene?

   Yes ____ No ____

7. Is an alcohol based hand rub (ABHR) available for hand hygiene at your facility?

   Yes ____ No ____

8. What do you think is the average compliance of health care providers in your hospital performing hand hygiene either by handrubbing or handwashing when recommended to do so?
   Please circle the percentage according to your opinion.

   10% 20% 30% 40% 50% 60% 70% 80% 90% 100%

Please circle the number on the scale that reflects your opinion.

Adapted from World Alliance for Patient Safety, World Health Organization, Annex 31

Baseline Hand Hygiene Perception Survey – Health Care Providers

9. Among all patient safety issues, how important is hand hygiene for the leaders of your facility?

Low Priority 1 2 3 4 5 Very High Priority

10. In your opinion, how effective would the following actions be to increase hand hygiene permanently in your facility?

a. leaders at your facility support and openly promote hand hygiene

Not Effective 1 2 3 4 5 Very Effective

b. the health care facility provided alcohol-based handrub available at each point of care*

Not Effective 1 2 3 4 5 Very Effective

*Point-of-Care (POC) is where three elements are present at the same time: the patient, the health care provider and care involving contact is taking place

c. hand hygiene prompts are displayed at point of care as reminders

Not Effective 1 2 3 4 5 Very Effective

d. each health care provider is educated and trained in hand hygiene

Not Effective 1 2 3 4 5 Very Effective

e. clear and simple instructions for hand hygiene are made visible for every health care provider

Not Effective 1 2 3 4 5 Very Effective

f. health care providers regularly receive feedback of the units results on hand hygiene performance

Not Effective 1 2 3 4 5 Very Effective

g. you perform hand hygiene perfectly (being a good example for your colleagues)

Not Effective 1 2 3 4 5 Very Effective

h. patients are invited to remind health care providers to perform hand hygiene

Not Effective 1 2 3 4 5 Very Effective

Adapted from World Alliance for Patient Safety, World Health Organization, Annex 31

Baseline Hand Hygiene Perception Survey – Health Care Providers

j. the health care facility has a hand care* program to support healthy hands

Not Effective 1 2 3 4 5 Very Effective

*Hand Care: Actions and products that reduce the risk of skin irritation

11. What importance does the head of your department attach to the fact that you perform optimal hand hygiene?

No Importance 1 2 3 4 5 Very High Importance

12. What importance do your colleagues attach to the fact that you perform optimal hand hygiene?

No Importance 1 2 3 4 5 Very High Importance

13. What importance do patients attach to the fact that you perform optimal hand hygiene?

No Importance 1 2 3 4 5 Very High Importance

14. How do you consider the effort required by you to perform good hand hygiene when caring for patients?

A Big Effort 1 2 3 4 5 No Effort

15. What is your average compliance when performing hand hygiene either by handrubbing or handwashing as recommended?

10% 20% 30% 40% 50% 60% 70% 80% 90% 100%

16. Do you have healthy intact skin on your hands that is free from irritation?

Skin is very irritated 1 2 3 4 5 Skin is intact, healthy

Adapted from World Alliance for Patient Safety, World Health Organization, Annex 31

Knowledge and
Attitude Surveys Tool 13 – Larson (2004) Attitudes Regarding
Practice Guidelines

Table 2. Instrument
Attitudes Regarding Practice Guidelines
The purpose of this survey is to identify those factors that help or hinder clinicians to use practice guidelines.
My Profession: (1) Nursing___ (2) Medicine___ (3) Other (specify) ___

Score*	**Part 1. Please rate the extent to which you agree or disagree with each of the following statements regarding clinical practice guidelines IN GENERAL**	Strongly disagree	Disagree	Somewhat disagree	Somewhat agree	Agree	Strongly agree
+	1. I am familiar with the practice guidelines in my field.	☐	☐	☐	☐	☐	☐
–	2. There are so many guidelines available that it is nearly impossible to keep up.	☐	☐	☐	☐	☐	☐
+	3. In my field, I find practice guidelines readily available.	☐	☐	☐	☐	☐	☐
–	4. I don't have the time to stay informed about available guidelines.	☐	☐	☐	☐	☐	☐
–	5. Guidelines are too "cookbook" and prescriptive.	☐	☐	☐	☐	☐	☐
+	6. Practice guidelines are practical to use.	☐	☐	☐	☐	☐	☐
–	7. Generally, practice guidelines are cumbersome and inconvenient.	☐	☐	☐	☐	☐	☐
–	8. Guidelines are difficult to apply and adapt to my specific practice.	☐	☐	☐	☐	☐	☐
+	9. In this organization, practice guidelines are important.	☐	☐	☐	☐	☐	☐
+	10. Guidelines improve patient outcomes.	☐	☐	☐	☐	☐	☐
–	11. Generally, the costs of practice guidelines outweigh the benefits.	☐	☐	☐	☐	☐	☐
–	12. Guidelines interfere with my professional autonomy.	☐	☐	☐	☐	☐	☐
–	13. Generally, I would prefer to continue my routines and habits rather than to change based on practice guidelines.	☐	☐	☐	☐	☐	☐
–	14. I am not really expected to use guidelines in my practice setting.	☐	☐	☐	☐	☐	☐
–	15. Publishing practice guidelines increases the risk of malpractice liability.	☐	☐	☐	☐	☐	☐
+	16. Guidelines help to standardize care and assure that patients are treated in a consistent way.	☐	☐	☐	☐	☐	☐
+	17. In my practice setting, there is sufficient administrative support and resources to allow the implementation of practice guidelines.	☐	☐	☐	☐	☐	☐
+	18. Patients are generally aware of practice guidelines related to their condition	☐	☐	☐	☐	☐	☐
Score*	**Part 2. This section relates specifically to the CDC's Hand Hygiene Guideline published in 2002. Please rate the extent to which you agree or disagree with each of the following statements regarding the Hand Hygiene Guideline SPECIFICALLY.**						
	1. I am familiar with the Hand Hygiene Guideline and its recommendation. (*NOTE: If you are not familiar with this Guideline, skip to the last question, #22.*)	☐	☐	☐	☐	☐	☐
+	2. The Hand Hygiene Guideline is readily accessible if I want to refer to it.	☐	☐	☐	☐	☐	☐
+	3. If we follow the recommendations of the Guideline in our practice setting. It is likely that nosocomial infection rates will decrease.	☐	☐	☐	☐	☐	☐
–	4. If I follow the recommendations of the Guideline, it is likely that my hands will be in worse shape (e.g., drier, more skin damage).	☐	☐	☐	☐	☐	☐
–	5. The costs of the Hand Hygiene Guideline outweigh the benefits.	☐	☐	☐	☐	☐	☐
+	6. I have confidence that the developer of the Guideline is well qualified and knowledgeable about hand hygiene.	☐	☐	☐	☐	☐	☐
+	7. The recommendations of the Guideline are relevant to my patient population.	☐	☐	☐	☐	☐	☐
+	8. The person I report to expects me to use the Guideline.	☐	☐	☐	☐	☐	☐
+	9. The Guideline is based on sound scientific evidence.	☐	☐	☐	☐	☐	☐
–	10. It is not really practical to follow the Guideline recommendations.	☐	☐	☐	☐	☐	☐
–	11. I do not wish to change my hand hygiene practices, regardless of what the Guideline recommends.	☐	☐	☐	☐	☐	☐
+	12. I feel competent using alcohol hand products in accordance with the Guideline recommendations.	☐	☐	☐	☐	☐	☐
–	13. My patients prefer to see me do a traditional handwash.	☐	☐	☐	☐	☐	☐
–	14. There are other guidelines regarding hand hygiene that conflict with this one.	☐	☐	☐	☐	☐	☐
–	15. I don't have the time to use this Guideline.	☐	☐	☐	☐	☐	☐

Table 2. Continued

Score*	Part 2. This section relates specifically to the CDC's Hand Hygiene Guideline published in 2002. Please rate the extent to which you agree or disagree with each of the following statements regarding the Hand Hygiene Guideline SPECIFICALLY.	Strongly disagree	Disagree	Somewhat disagree	Somewhat agree	Agree	Strongly agree
+	16. I have access to the necessary supplies and equipment to use the Guideline.	☐	☐	☐	☐	☐	☐
+	17. If I don't use the Guideline, I may be liable for malpractice.	☐	☐	☐	☐	☐	☐
−	18. The Guideline is cumbersome and inconvenient.	☐	☐	☐	☐	☐	☐
+	19. I personally have implemented the recommendations of the Hand Hygiene Guideline.	☐	☐	☐	☐	☐	☐
	20. For me, the most important *factor* that did or would influence me to implement the hand hygiene guideline is:						
	21. For me, the most important *barrier* to implementing the hand hygiene guideline is:						
	22. In your work setting, what percentage of the time do you use waterless alcohol-based products for hand hygiene?	___Never ___Rarely (<10% of time) ___Sometimes (10%-50% of time) ___Almost always (>90% of time)					

*Scoring:

	Strongly disagree	Disagree	Somewhat disagree	Somewhat agree	Agree	Strongly agree
+	0	1	2	3	4	5
−	5	4	3	2	1	0

ıideline for Hand Hygiene in Health-Care
ons of the Healthcare Infection Control
mmittee and the HIPAC/SHEA/APIC/IDSA
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hma guidelines. Arch Pediatr Adolesc Med

Structural Surveys Tool 14 – WHO Questionnaire on Ward Structures for Hand Hygiene

WORLD ALLIANCE *for* PATIENT SAFETY

World Health Organization

ANNEX 32

SITE ID:

Questionnaire on *ward structures* for hand hygiene

1. Date: _____ 2. Hospital: _____

3. Ward: _____ 4. Service: _____

5. Department (please select one department closest to yours):

O Internal medicine O Surgery O Intensive care unit O Mixed medical/surgical
O Emergency unit O Obstetrics O Paediatrics O Long-term/rehabilitation
O Outpatient clinic O Other

6. Position of the person completing this questionnaire:

O Head nurse O Head physician O Study co-ordinator O Study deputy co-ordinator O Other team member

7. Number of health-care workers on this ward: Nurses: _____ Physicians: _____ Auxiliaries: _____

8. Is water regularly available? O Always O Intermittently O Rarely O Never

9. Is running water available? O Yes O No

10. Is water clean? O Yes O No O Don't know

11. Is an alcohol-based handrub available? O Always O Intermittently O Rarely O Never

12. If yes, what type of handrub dispensers are available? (multiple choice)

O Pocket bottle O Bottle affixed to trolley/tray O Bottle affixed to bed O Wall dispenser

13. If wall dispensers are available, are they placed within an arm's reach from point of care (e.g. around the patient's bed)?

O Yes O No

14. Is there an assigned person responsible for the refilling or replacement of empty dispensers? O Yes O No

15. If available, does every health-care worker have easy access to handrub pocket bottles?

O Always O Intermittently O Rarely O Never

16. If available, are the other types of handrub dispenser replaced when empty?

O Always O Intermittently O Rarely O Never

17. Are posters illustrating handwash technique displayed beside each sink? O Yes O No

18. Are posters illustrating handrub technique displayed at the point of care*? O Yes O No

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19. Are posters illustrating indications for hand hygiene displayed at the point of care*? O Yes O No

20. Are hand hygiene promotional posters displayed on this ward? O Yes O No

21. Are written guidelines with recommendations on hand hygiene accessible on this ward? O Yes O No

22. Are disposable gloves available on this ward? O Always O Intermittently O Rarely O Never

23. Are stocks of gloves stored on this ward? O Yes O No

24. Are audits on hand hygiene compliance periodically performed on this ward? O Yes O No

25. If yes, how frequently? O at least once a year O at least once every two years O less frequently

26. Have nurses on this ward received specific education on hand hygiene in the last two years? O Yes O No

27. Have physicians on this ward received specific education on hand hygiene in the last two years? O Yes O No

Please now walk to each room or area where patient care/treatment takes place in this ward (i.e. the point of care*) and complete the table below

	Room N°/ ID	Total N° of beds in this room/ area	N° of beds with handrub within arm's reach	N° of sinks in this room/area	N° of sinks with clean water, soap, towel	Total n° of handrub dispensers in this room/area	N° of fully-functioning and filled dispensers	N° of health-care workers encountered	N° of health-care workers encountered with handrub bottle in their pocket
A) Patient rooms on this ward									
1									
2									
3									
4									
5									
6									
7									
8									
9									
10									
11									
12									
13									
14									
15									
B) Treatment rooms (ambulatory, day hospital, etc.)									
1									
2									
3									
4									
5									
C) Corridors and other areas with points of care*									
1									
2									
3									
4									
5									
TOT									

TOT: total; N° = number

*Point of care: the place where three elements occur together: the patient, the health-care worker, care or treatment involving patient contact.

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Baseline Hand Hygiene Unit Structures Survey

Our hospital is planning to implement the Ontario *Just Clean Your Hands* Program. The goal is to improve patient and health care provider safety through a multi facetted approach to make hand hygiene easier to perform at the right time. Our hospital is asking unit managers to complete this survey so that we can learn about the unit structures for hand hygiene. The survey will be filled in before the program is introduced and then again after the program has been implemented.

1. Facility Site: (optional) _____

2. Date: _____

3. Unit: _____

4. Department (please select **one** department which is closest to yours):
   - ≤ Medicine
   - ≤ Surgery
   - ≤ Intensive care unit
   - ≤ Mixed medical/surgical
   - ≤ Emergency unit
   - ≤ Obstetrics
   - ≤ Newborn nursery
   - ≤ Paediatric
   - ≤ Diagnostic imaging
   - ≤ Dialysis
   - ≤ Outpatient clinic
   - ≤ Other

5. Position of person completing survey:
   - ≤ Nursing manager
   - ≤ Physician in charge
   - ≤ Hand Hygiene Coordinator
   - ≤ Other team member (define)

6. Number of health care providers in total who work on this unit:
   Nurses____
   PSA/PWA/PCA_ ___
   Physicians_____
   Students_____
   Allied Health care workers_____
   Environmental service workers_____
   Other_____

7. Is an alcohol based hand rub (ABHR) available for hand hygiene on your unit?
   Yes _____ No _____

8. If yes, check what type of hand rub dispensers are available.
   - ≤ wall dispenser
   - ≤ bottle affixed to bed
   - ≤ pocket bottle
   - ≤ bottle affixed to carts (medication C.O.W)
   - ≤ other

9. Is there alcohol based hand rub (ABHR) available for hand hygiene at point of care*?
   Yes _____ No _____
   *Point-of-Care (POC) is where three elements are present at the same time: the patient, the health care provider and care involving contact is taking place)

10. Is there an assigned person responsible for the replacement of empty dispensers?
    Yes _____ No _____

Adapted from World Alliance for Patient Safety, World Health Organization, Geneva

11. Are posters for hand hygiene technique posted?

    Yes ____ No ____

12. Is there a plan in place to have all the unit health care providers attend hand hygiene education sessions?

    Yes ____ No ____

13. Are audits on hand hygiene compliance using a standard observer tool and analysis periodically performed on the unit?

    Yes ____ No ____

14. What is the frequency of the audits?

    ≤ Every 6 months ≤ At least yearly ≤ Less frequently

15. Is there timely feedback of the aggregate audit results to the health care providers and an action plan developed to improve results?

    Yes ____ No ____

Adapted from World Alliance for Patient Safety, World Health Organization [illegible]

Structural Surveys Tool 16 – Ontario Facility-level Situation Assessment

Facility-Level Situation Assessment

Overview:
This tool gathers information about the existing structures, resources and culture of your facility related to patient safety and infection prevention and control. It will help to establish a general baseline relating to constraints and strengths which will assist in successful implementation planning and ongoing progress measurement.

Each site will have its own unique culture. As a result, hospital corporations may choose to complete one facility-level situation analysis for each site.

Facility Name: _____

Response Key:	
Fully implemented	
Given priority and there is clear evidence of action	4
Given priority but no action taken	3
Under discussion but there is no decision to act	2
No discussion around this activity	

Leadership and Strategy		4	3	2	
Someone in senior management is in charge of patient safety					
Patient safety is clearly articulated in the organization's strategic plan					
Improved hand hygiene adherence is a priority within the facility					
There is an existing multi-disciplinary committee that can oversee local implementation of a hand hygiene program					
The committee regularly meets (at least every two months)					
There are visible role models/champions for hand hygiene					
The facility has implemented a hand hygiene policy					
The hand hygiene policy is based on the Ontario Provincial Infectious Diseases Advisory Committee hand hygiene fact sheet for health care settings					
There is a dedicated budget allocated for patient safety activities					
The budget includes funding for education and training on patient safety issues such as hand hygiene					
There is a central budget to cover costs for supporting hand hygiene such as:					
• alcohol-based hand rub at point of care					
• lotion					
• good quality paper towels					
• maintenance of dispensers and products					
A hand care protection program has been implemented for staff					

JUST CLEAN YOUR HANDS

Ontario

Patient Safety Culture and Climate, and Patient Involvement	4	3	2
Health care providers are encouraged to report Infection Prevention and Control and Patient Safety needs/failures/mistakes			
Health care providers can do this without any punitive action being taken (blame free environment)			
The facility provides information to patients to help them understand their roles as partners in patient safety			
The facility provides information to patients to help them understand when health care providers should clean their hands before providing care			
The facility provides information to patients to help them understand the role of personal hand hygiene while they are in health care settings			
Patients are encouraged to ask health care providers to perform hand hygiene			
System Support	**4**	**3**	**2**
An alcohol-based hand rub is used within the facility			
Alcohol-based hand rubs are readily available at the point of care/near to patient – e.g., where patient can see health care provider clean their hands			
Alcohol-based hand rubs are readily available to each health care provider – in individual pocket bottles			
Hand washing sinks for health care providers are available in all rooms where patient care/procedures occur			
Health care providers have access to lotions			
Education and Training	**4**	**3**	**2**
There is a training program on hand hygiene			
Training on basic infection prevention and control is included in new employee orientation			
Training on hand hygiene is compulsory for all health care providers			
Health care providers are offered ongoing education on patient safety and infection prevention and control issues			

Reminders in the Workplace	4	3	2
Alcohol-based hand rubs are promoted to be used at the point of care/near to patient care			
Educational information on hand hygiene is distributed to health care providers			
Promotional items on hand hygiene are distributed to health care providers			
Reminders (posters) on hand hygiene are visible on hospital walls			
Monitoring and Evaluation	**4**	**3**	**2**
There is a system to report health care-associated infections			
The surveillance system on health care-associated infections is based on standardized definitions			
Unit-specific data on health care-associated infection rates are fed back to the unit			
Antibiotic prescribing is monitored and evaluated			
Usage of alcohol-based hand rub is measured			
Direct observation audits of compliance with hand hygiene practices are carried out			
There is a process to provide timely feedback of the audit results to: • health care providers • senior management • board			
Additional costs due to health care-associated infections are monitored			
The impact of education programs is evaluated			

Completed by:

Role: _____

E-mail address: _____

Phone number: _____

Date: _____

For more information, please visit **www.justcleanyourhands.ca**

Ministry of Health and Long-Term Care acknowledges the WHO World Alliance for Patient Safety for sharing their "Clean Care is Safer Care" materials. This tool is a local adaptation of Annex 6 – WHO Facility-level situation analysis.

1M - Jan/08 © Queen's Printer for Ontario

Patient Survey Questionnaire

Question and Answer Sheet for Patients

What is the survey about?

The survey is about patients' thoughts on the Hand Hygiene Improvement Program. Hand hygiene is the process of cleaning your hands. There are two methods of hand hygiene: washing with soap and water or the use of an alcohol-based hand rub/sanitizer.

Do I have to do the survey?

No, it is completely voluntary. But, the more patients that do the survey, the more helpful the results will be for the hospital to provide improved care to patients.

Do I have to write my name on the survey?

No, the survey is completely anonymous. Please do not write your name anywhere on the survey.

How long is it going to take?

About 5-10 minutes.

Can I take it home to do it?

No, the survey is to be filled out at the hospital. It should only take about 5-10 minutes to complete.

Can I get my family member/friend to help me fill out the survey?

Yes, your family member/friend can help you fill out the survey.

Can you (i.e. hospital health care worker) help me fill out the survey?

No, I'm sorry but hospital staff cannot help you fill out the survey. Your answers are confidential.

What if I can't answer all of the questions?

That's okay. Just do what you can. If you have questions about something you don't understand, the survey includes the name and phone number of someone you can call (On-site Project Coordinator name, number)

Patient Survey Questionnaire[11]

Thank you very much for participating in the Hand Hygiene Patient Survey. The purpose of this survey is to help hospitals and the Ontario Ministry of Health and Long-term Care (MOHLTC) understand what patients think about hand hygiene at this hospital. This survey should take you about 5-10 minutes and is voluntary. If you decide not to complete this survey it will not affect the future care you receive.

> Hand hygiene is the process of cleaning your hands. There are two methods of hand hygiene: washing with soap and water or the use of an alcohol-based hand rub/sanitizer.

Completing this survey is your choice and your feedback is important. Your answers are anonymous, which means that no one can link your name with your answers. Please do not put your name on this survey. Your answers will not be seen by anyone at the hospital – only the survey consultants will have access to the anonymous survey information. Your answers will not affect any future care for yourself or your family members at this hospital.

We will ensure that your privacy is protected. If you have any questions, please call [name and number of On-site Project Coordinator].

We are doing this evaluation as a research project. If you have any questions about your rights as a research participant, please call [name and number of pilot sponsor]. This person is not involved with the research project in any way and calling him/her will not affect your participation.

When you have completed the survey, please put it in the envelope provided, seal the flap, and give the envelope back to the person who gave you the survey, or put it in the survey drop-off box.

Thank you again for your participation.

[11] Adapted from National Patient Safety Organization. Achieving our aims – evaluating the results of the pilot CleanyourHands campaign. 2004.

Patient Survey Questionnaire

Today's date: _____(Day) ____ (Month) _____ (Year)

Answer Selection: Correct = ● Incorrect = ☒ ☑ ⊖

1. During your recent stay at the hospital, did a health care worker or doctor explain the Hand Hygiene Program to you?

Select one only:

- ○ Yes
- ○ No
- ○ Not sure

2. In the last 24 hours, have you seen a doctor or health care worker clean their hands? (Hand cleaning includes washing with soap and water or using an alcohol-based hand rub.)

Select one only:

- ○ Yes
- ○ No
- ○ Not sure

3. What would you normally do if you thought a doctor or other health care worker had not cleaned their hands before they touched you?

Select all that apply:

- ○ Nothing
- ○ Say something to the health care worker directly
- ○ Say something to another health care worker
- ○ Say something to my visitor/family member
- ○ Not sure

4. During your recent stay at the hospital, did you remind your doctor(s) and/or other health care workers to clean their hands?

Select one only:

- ○ Yes
- ○ No

5. How comfortable did you feel (or would you feel) reminding your **doctor(s)** to clean their hands?

Select one only:

- ○ Very comfortable
- ○ Somewhat comfortable
- ○ Somewhat uncomfortable
- ○ Very uncomfortable

6. How comfortable did you feel (or would you feel) reminding the **other health care workers** to clean their hands?

Select one only:

- ○ Very comfortable
- ○ Somewhat comfortable
- ○ Somewhat uncomfortable
- ○ Very uncomfortable

7. What made (or would make) you feel comfortable asking **doctors or other health care workers** to clean their hands?

8. Should patients be involved in reminding doctors and other health care workers to clean their hands?

Select one only:

- ○ Yes
- ○ No
- ○ Not sure

Please explain your answer:

9. Do you think health care workers clean their hands when they should?

Select one only:

- ○ Yes, always
- ○ Yes, but only sometimes
- ○ Yes, but very rarely
- ○ No, they never clean their hands when they should

10. Does knowing there is a Hand Hygiene Program at the hospital make you feel more confident about the care being given to you?

Select one only:

- ○ Yes, a lot more confident
- ○ Yes, somewhat more confident
- ○ Yes, but only slightly more confident
- ○ No, doesn't change how I feel about my care
- ○ No, it makes me less confident in my care

11. Please indicate if you are a:

Select one only:

- ○ Patient
- ○ Spouse, partner
- ○ Relative
- ○ Friend
- ○ Other (please explain):

Thank you for taking the time to complete this form. Your feedback is very valuable and will help with future projects.

Please put the completed survey in the envelope provided, seal the flap, and give the envelope back to the person who gave you the survey, or put it in the survey drop-off box

THIS SECTION IS FOR INTERNAL USE ONLY. PLEASE DO NOT FILL IN.

| | | | | | |

Guiding Questions for Interim Health Care Worker Focus Groups

Question/Item
Entry, collecting food, and getting settled
Thank you for attending this focus group today. My name is [facilitator name], and I will be facilitating the focus group. This is [notetaker name], who will be taking notes as we proceed. [Notetaker name] will also be tape recording the session so that we can be sure that your views are accurately captured in the notes. As you know, this focus group is part of an evaluation of a hand hygiene program that is being funded by the Ontario Ministry of Health and Long-Term Care, and that will be pilot tested in your hospital. The Ministry would like to know what is working well and what should be improved before they roll the program out across the province. Over the next [hour/two hours], we will ask you to talk about your views on hand hygiene in hospital settings and ways that it can be improved. There are no right or wrong answers to the questions we will be asking – we are simply asking for your honest opinions. As you can see, there are refreshments available at the side of the room. Please feel free to help yourself to these throughout the discussion. Because we have a number of things to discuss during this session, we may move through some of them fairly quickly. If you wish to agree with something that has already been said, please do so by saying "I agree with so&so" rather than by restating their point, and then add any new ideas or thoughts you wish to share. Do you have any questions before we begin?
1. Please tell us your first name and how long you have been working on [name of unit].
2. Thinking of the last time you cleaned your hands at work, what was it that prompted you to do so? *By "prompt," I mean internal or external triggers or cues that might alert you to wash your hands (i.e., external prompts such as visual cues or internal prompts such as fear or habit).*
3. For this next question, I would like you to write down your ideas on the paper we have provided. We will collect the papers afterwards and you will also have a chance to share your answers with the group if you wish. In the context of patient care, when do you think it is important to clean your hands?

Question/Item
11. How do you feel about engaging patients in the hand hygiene practices of health care workers? ▪ *What is the best way to engage patients?*
12. The evaluation of the hand hygiene program has included observers who are measuring hand hygiene compliance. To what extent has the presence of the observers changed your hand hygiene behaviour? ▪ *Comfort level with the observers* ▪ *Impact of feedback from hand hygiene audits*
13. From what I have heard today, hand cleaning is a (very/somewhat/not at all important) part of your work. I have also heard that there are several things that have an impact on your hand cleaning when you are at work. (describe the major themes, including any areas where conflicting comments were made, and including any elements of the program that were particularly effective.) I also understood that you would like to see some things changed about the program (describe the major themes). Have I understood you correctly? Is there anything else you would like to add? ▪ *For physician group: if you would like to stay to talk further about some of these issues, please feel free to do so.*

Other Surveys Tool 19 – WHO Evaluation of tolerability and acceptability of alcohol-based hand rub

Questionnaire – part 1

(to complete once per participant, after one month)

Participant n° ..... Date of questionnaire's return ...../...../..... (day, month, year)

Evaluation of factors influencing skin tolerance

- Age .....
- Sex:

O f | O m

Professional group:

O Nurse | O Midwife | O Student | O Auxiliary | O Medical doctor | O Medical student | O Therapist | O Technician | O Other

Skin:

O Very fair with freckles | O Fair with ± freckles | O Light brown | O Brown | O Dark brown | O Black

Climate:

O Polar | O Continental / Temperate | O Subtropical / Mediterranean | O Desert | O Tropical / Equatorial

Present season:

O Dry | O Humid | O Cold | O Hot | O Intermediate

- Do you have non work-related activity(ies) likely to cause damage to your skin? O Yes | O No
- Do you normally use a protective hand lotion/cream (outside the test period)?

O As often as possible | O Several times/day | O 1/day | O Sometimes, depending on the season | O Rarely | O Never

- Do you develop irritative dermatitis? O Never | O Sometimes (depending on season/activity) | O Always
- Do you develop atopic dermatitis? O Yes | O No
- Do you develop rhinitis / allergic conjunctivitis? O Yes | O No
- Are you asthmatic? O Yes | O No

Do you have a known intolerance to alcohol? O Yes | O No

Evaluation of frequency of hand hygiene practices

- Do you work full-time? O Yes | O No
- If part-time, please indicate which of the following best fits your work

O < 50% | O 50% | O 60% | O 70% | O 80% | O 90%

- For how long have you been using an alcohol-based hand hygiene product at work?

O It's the first time | O Since < 1 year | O Since > 1 year and < 5 years | O Since > 5 years

- Do you think you can improve your own hand hygiene compliance? O Yes | O No | O Perhaps
- It may be difficult for you to use an alcohol-based hand hygiene product because of:

Forgetfulness	Always	O	O	O	O	O	O	O	Never
Lack of time	Always	O	O	O	O	O	O	O	Never
Damaged skin	Always	O	O	O	O	O	O	O	Never

WHO acknowledges the Hôpitaux Universitaires de Genève (HUG), in particular the members of the Infection Control Programme, for their active participation in developing the manual

Questionnaire – part 2

(to be completed after the 3-5 first consecutive days of product use and after one month of product use)

Participant n°	Product	Date of questionnaire's return ...../...../..... (day month year)
Participant name	Number of distributed bottles	Amount of product used (ml) .....

Evaluation of frequency of hand hygiene practices

- During how many consecutive working days have you used the test product?

O 3 days	O 4 days	O 5 days	O 6 days	O 7 days	O > 7 days

- How often do you have direct contact with patients during your working day (during the test period)?

O < 1 contact	O Between 1 and 5	O Between 6 and 10	O Between 11 and 15	O > 15 contacts

- In what percentage of times where hand hygiene is recommended, do you really clean your hands?

O 0%	O 10%	O 20%	O 30%	O 40%	O 50%	O 60%	O 70%	O 80%	O 90%	O 100%

- Has the present study changed your hand hygiene practice? O Yes | O No

- During your last 5 opportunities for hand hygiene, how many times did you use hand rubbing to clean your hands?

O 0	O 1	O 2	O 3	O 4	O 5

- How often do you practise hand hygiene during an average working hour (during the test period)?

O <1	O Between 1 and 5	O Between 6 and 10	O Between 11 and 15	O >15

Evaluation of the test product

- What is your opinion of the test product for hand hygiene?

Colour	Unpleasant	O	O	O	O	O	O	O	Pleasant
Smell	Unpleasant	O	O	O	O	O	O	O	Pleasant
Texture	Very sticky	O	O	O	O	O	O	O	Not sticky at all
Irritation (stinging)	Very irritating	O	O	O	O	O	O	O	Not irritating
Drying effect	Very much	O	O	O	O	O	O	O	Not at all
Ease of use	Very difficult	O	O	O	O	O	O	O	Very easy
Speed of drying	Very slow	O	O	O	O	O	O	O	Very fast
Application	Very unpleasant	O	O	O	O	O	O	O	Very pleasant
Overall evaluation	Dissatisfied	O	O	O	O	O	O	O	Very satisfied

- Are there differences between the test product and the product used in your hospital?

Major	O	O	O	O	O	O	O	No

- Which product do you prefer? O Usual product | O Test product | O No preference

- Do you think that the test product could improve your hand hygiene compliance?

Yes, absolutely	O	O	O	O	O	O	O	Not at all

Evaluation of skin condition

- Self-assessment of the skin on your hands (after use of the test product):

Appearance (supple, red, blotchy, rash)	Abnormal	O	O	O	O	O	O	O	Normal
Intactness (abrasions, fissures)	Abnormal	O	O	O	O	O	O	O	Normal
Moisture content (dryness)	Abnormal	O	O	O	O	O	O	O	Normal
Sensation (itching, burning, soreness)	Abnormal	O	O	O	O	O	O	O	Normal

- How would you assess the overall integrity of the skin on your hands?

Very altered	O	O	O	O	O	O	O	Perfect

Thank you for your participation!

WHO acknowledges the Hôpitaux Universitaires de Genève (HUG), in particular the members of the Infection Control Programme, for their active participation in developing this material.

Skin Objective Evaluation – part 3

(to be completed three times: before the product use, after the 3-5 first consecutive days of product use and after one month of product use)

Participant n°.....	Date of the 1st evaluation ..../..../..... (day, month, year) Date of the 2nd evaluation ..../..../..... (day, month, year) Date of the 3rd evaluation ..../..../..... (day, month, year)

Scales to evaluate skin condition by the observer (objective evaluation)

	Before					After 3-5 days					After 1 month				
Redness	0	1	2	3	4	0	1	2	3	4	0	1	2	3	4
0=no redness, 1=slight redness or blotchiness, 2=moderate redness, uniformly distributed, 3=bright red, widespread, 4=very bright red with oedema present															
Scaliness	0	1	2	3		0	1	2	3		0	1	2	3	
0=non scaliness, 1=very slight and occasional, 2=moderate, 3=very pronounced separation of scale edges from skin															
Fissures	0	1	2	3		0	1	2	3		0	1	2	3	
0=no fissure 1=very fine, 2=large, either single or multiple, 3=extensive cracks with bleeding or seeping															
Visual Scoring of Skin Scale															
No observable scale or irritation of any kind	0					0					0				
Occasional scale that is not necessarily uniformly distributed	1					1					1				
Dry skin and/or redness	2					2					2				
Very dry skin with whitish appearance, rough to touch and/or redness, but without fissures	3					3					3				
Cracked skin surface but without bleeding/seeping	4					4					4				
Extensive cracking of skin surface with bleeding/seeping	5					5					5				

WHO acknowledges the Hôpitaux Universitaires de Genève (HUG), in particular the members of the Infection Control Programme, for their active participation in developing this material

5. Control form - method 1

CONTROL FORM FOR TEST OF TOLERABILITY AND ACCEPTABILITY OF AN ALCOHOL-BASED HANDRUB
Method 1

Participant N°	Name	Appointment		Distributed bottles/ Returned bottles		Remaining weight/ Amount used		Questionnaire check		Skin assessment	
	....	1st day ..../..../.... 3rd-5th day ..../..../.... Last day ..../..../....	time .....:..... time .....:..... time .....:.....	N° ..... N° ..... N°	○ ○ ○	..... g ..... g ..... g	..... ml	Part2 distributed 1st d. Part2 returned 3rd-5th d. Part1/2 distributed last d. Part1/2 returned last d.	○ ○ ○ ○	Before 1st d. After 3-5 days After 1 month	○ ○ ○
	....	1st day ..../..../.... 3rd-5th day ..../..../.... Last day ..../..../....	time .....:..... time .....:..... time .....:.....	N° ..... N° ..... N°	○ ○ ○	..... g ..... g ..... g	..... ml	Part2 distributed 1st d. Part2 returned 3rd-5th d. Part1/2 distributed last d. Part1/2 returned last d.	○ ○ ○ ○	Before 1st d. After 3-5 days After 1 month	○ ○ ○
	....	1st day ..../..../.... 3rd-5th day ..../..../.... Last day ..../..../....	time .....:..... time .....:..... time .....:.....	N° ..... N° ..... N°	○ ○ ○	..... g ..... g ..... g	..... ml	Part2 distributed 1st d. Part2 returned 3rd-5th d. Part1/2 distributed last d. Part1/2 returned last d.	○ ○ ○ ○	Before 1st d. After 3-5 days After 1 month	○ ○ ○
	....	1st day ..../..../.... 3rd-5th day ..../..../.... Last day ..../..../....	time .....:..... time .....:..... time .....:.....	N° ..... N° ..... N°	○ ○ ○	..... g ..... g ..... g	..... ml	Part2 distributed 1st d. Part2 returned 3rd-5th d. Part1/2 distributed last d. Part1/2 returned last d.	○ ○ ○ ○	Before 1st d. After 3-5 days After 1 month	○ ○ ○
	....	1st day ..../..../.... 3rd-5th day ..../..../.... Last day ..../..../....	time .....:..... time .....:..... time .....:.....	N° ..... N° ..... N°	○ ○ ○	..... g ..... g ..... g	..... ml	Part2 distributed 1st d. Part2 returned 3rd-5th d. Part1/2 distributed last d. Part1/2 returned last d.	○ ○ ○ ○	Before 1st d. After 3-5 days After 1 month	○ ○ ○
	....	1st day ..../..../.... 3rd-5th day ..../..../.... Last day ..../..../....	time .....:..... time .....:..... time .....:.....	N° ..... N° ..... N°	○ ○ ○	..... g ..... g ..... g	..... ml	Part2 distributed 1st d. Part2 returned 3rd-5th d. Part1/2 distributed last d. Part1/2 returned last d.	○ ○ ○ ○	Before 1st d. After 3-5 days After 1 month	○ ○ ○
	....	1st day ..../..../.... 3rd-5th day ..../..../.... Last day ..../..../....	time .....:..... time .....:..... time .....:.....	N° ..... N° ..... N°	○ ○ ○	..... g ..... g ..... g	..... ml	Part2 distributed 1st d. Part2 returned 3rd-5th d. Part1/2 distributed last d. Part1/2 returned last d.	○ ○ ○ ○	Before 1st d. After 3-5 days After 1 month	○ ○ ○
	....	1st day ..../..../.... 3rd-5th day ..../..../.... Last day ..../..../....	time .....:..... time .....:..... time .....:.....	N° ..... N° ..... N°	○ ○ ○	..... g ..... g ..... g	..... ml	Part2 distributed 1st d. Part2 returned 3rd-5th d. Part1/2 distributed last d. Part1/2 returned last d.	○ ○ ○ ○	Before 1st d. After 3-5 days After 1 month	○ ○ ○

WHO acknowledges the Hôpitaux Universitaires de Genève (HUG), in particular the members of the Infection Control Programme, for their active participation in developing this material

6. Planning for evaluation of tolerability and acceptability of alcohol-based handrub in use - Method 1

WORLD ALLIANCE *for* PATIENT SAFETY

World Health Organization

Planning for evaluation of tolerability and acceptability of alcohol-based handrub in use - Method 1

Name: ..... Participant n° ....

Test period: from ...../...../..... (day, month, year) to ...../...../..... (day, month, year)

Please note the timetable of your appointments

WHEN			WHY
1st Date and time	...../...../..... (day, month, year)	....:.... (time)	- to collect bottles containing the test product (amount defined according to number of working days and volume of bottles) - to collect the questionnaire - part 2 - for skin assessment by the observer
2nd Date and time (after the first 3-5 consecutive days)	...../...../..... (day, month, year)	....:.... (time)	- to return all bottles - to return the questionnaire - part 2 - for skin assessment by the observer
3rd Date and time (after 1 month)	...../...../..... (day, month, year)	....:.... (time)	- to collect and return the questionnaire - part 1 - to collect and return the questionnaire - part 2 - for skin assessment by the observer

The observer can be contacted during working hours throughout the test period for questions and/or problems, at the following number: .....

WHO acknowledges the Hôpitaux Universitaires de Genève (HUG), in particular the members of the Infection Control Programme, for their active participation in developing this material.

Other Surveys Tool 20 – Ontario Assessment Tool for Health Care Provider Hands

Assessment Tool for Health Care Provider* Hands

This form is intended for use to identify hand skin problems so that a proactive approach is used to protect hands from skin breakdown.

It is intended for use:

a) At the initial assessment of hands of new health care providers

b) For assessment of hands of employed health care providers (e.g., this can occur with TB skin testing, fit testing or other mandated programs)

c) For those who have developed skin problems

Name:			**Date:**
Birthdate:	**Telephone:**	**Job Title:**	**Employee Number:**
Department:		**Number of years in current position:**	

Health care provider† is to complete Sections 1, 2, 3, prior to Occupational Health assessment

Section 1

Assessment	Yes	No
Do you have healthy hands with intact skin that are free of irritation at all times? *If answer is "no" please continue questionnaire. If answer is "yes" proceed to Section 2.*		
What climate conditions adversely affect your hands? ☐ Dry ☐ Humid ☐ Cold ☐ Hot		
Do you have a chronic or recurrent skin condition *(e.g., eczema, psoriasis, hives)*? *If yes, provide details.*		
Do you have a history of allergies? *If yes, please specify type, onset period and symptoms.*		
Are you asthmatic?		
List any medications being used *(oral and topical – e.g., steroid cream)*:		

JUST CLEAN YOUR HANDS

* The Ministry of Health and Long-Term Care acknowledges St. Michael's Hospital and the provincial hand hygiene pilot hospitals for their active participation in developing this material and the WHO World Alliance for Patient Safety for sharing their "Clean Care is Safer Care" materials.

† Any person who delivers care to a patient or works within the patient environment or is involved in food handling (examples but not all inclusive are physicians, nurses, respiratory therapists and other allied health care professionals, cleaning staff; food services staff).

Ontario

Section 1 (cont'd)

Assessment	Yes	No
Do you have non-work-related activities likely to cause damage to your hands? Example:		
Gardening *(if yes, provide details)*		
Mechanics *(if yes, provide details)*		
Taking care of small children *(if yes, provide details)*		
Hands frequently in water and detergents *(if yes, provide details)*		
Smoking outdoors *(if yes, provide details)*		
Don't usually wear gloves in the winter *(if yes, provide details)*		
List any other activities and provide details:		
Have you a history of work involving "wet work or wet gloves"? *If yes, provide details.*		
Do you use a protective hand lotion/cream? a) At home? ☐ Greater than 5 times/day ☐ 2-5 times/day ☐ 1/day ☐ Rarely ☐ Never b) At work? ☐ Greater than 5 times/day ☐ 2-5 times/day ☐ 1/day ☐ Rarely ☐ Never		

Section 2

Evaluation of Frequency of Hand Hygiene Practices
Average number of hours worked per week:
For how long have you been using alcohol-based hand rub at work? ☐ It's the first time ☐ Less than 1 year ☐ Greater than 1 year/less than 5 years ☐ Greater than 5 years

Hand Cleaner *(Please indicate all used)*	**Number of times/day**	**Number of months used**
Alcohol-based hand rub	☐ 0-5 ☐ 6-10 ☐ 11-20 ☐ Over 20	
Water and antimicrobial soap	☐ 0-5 ☐ 6-10 ☐ 11-20 ☐ Over 20	
Water and liquid/foam/gel non-antimicrobial soap	☐ 0-5 ☐ 6-10 ☐ 11-20 ☐ Over 20	
Water only	☐ 0-5 ☐ 6-10 ☐ 11-20 ☐ Over 20	
Brush	☐ 0-5 ☐ 6-10 ☐ 11-20 ☐ Over 20	
Antimicrobial impregnated sponge	☐ 0-5 ☐ 6-10 ☐ 11-20 ☐ Over 20	
How many times do you wash/clean your hands during a working day? ☐ 0-5 ☐ 6-10 ☐ 11-20 ☐ Greater than 20		
Did you receive workplace training on how to protect and care for your skin? ☐ Yes ☐ No		

Exposure Assessment		
Gloves *(please indicate which glove types you use)*:		
☐ Latex	☐ Powdered	☐ Non-powdered
☐ Vinyl	☐ Powdered	☐ Non-powdered
☐ Nitrile	☐ Powdered	☐ Non-powdered
☐ Glove liners *(plastic/vinyl)*	☐ Powdered	☐ Non-powdered
☐ Glove liners *(cotton)*		
☐ Other, *please specify:*		

Section 3

Evaluation of Skin Condition		
Self-assessment of the skin on hands:		
Appearance *(supple, red, blotchy, rash)*	☐ Abnormal	☐ Normal
Intactness *(cracks, open areas)*	☐ Abnormal	☐ Normal
Moisture content *(dryness)*	☐ Abnormal	☐ Normal
Sensation *(itchy, burning, soreness)*	☐ Abnormal	☐ Normal
How would you assess the overall health of the skin on your hands? ☐ Very bad ☐ Good ☐ Perfect		

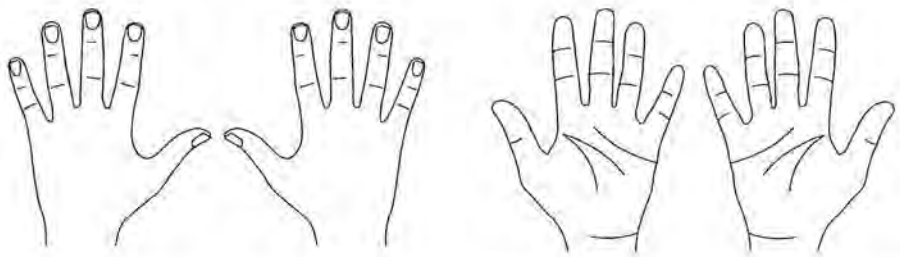
Occupational Health Professional to complete Sections 4, 5, 6 & 7

Section 4

Objective Evaluation of Skin Condition by the Occupational Health Professional
Check box reflecting skin condition at the date observed.

Dates				
Normal				
Dryness:				
Mild				
Moderate				
Severe				
Abnormal				

Identify size and area of irritated skin:



Section 5

Hand Washing Technique
Observe hand washing technique, list any improvements in technique recommended:
Verify the Ministry of Health and Long-Term Care hand hygiene interactive education module has been completed: ☐ Yes

Section 6

Further questions to be asked if there is any hand skin irritation.

Assessment	Yes	No
List any chemical exposures to hands including cosmetic products that may be an irritant:		
Are you exposed to any new products at the workplace? *(This could be chemicals or materials being used.) If yes, list what they are.*		
Has your job or work done as part of your job changed recently? *If yes, what?*		
Have there been any changes in the hand hygiene products used in the workplace? *If yes, list*		
Does the dermatitis improve after being away from work *(i.e., improves on days off and becomes worse when working)*?		
Have you changed any personal care products at home such as soap, lotions, sunscreen, laundry detergent/softening agents, etc.? *If yes, list.*		
Have you done anything different outside of work recently *(e.g., yard work, travel, hiking, contact with poison ivy)*?		

Section 7

Outline Action Plan	Yes	No
List recommendations:		
a) Work restrictions		
b) Hand care counseling		
c) Was a referral made? *If yes, where?*		
If yes, note that if this is work-related dermatitis, WSIB is to be notified. Was notification done? **www.wsib.on.ca**		
d) Other, list:		
Follow-up visit date, if indicated:		

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For further information on assessment and management go to Workplace Safety & Insurance Board at: www.wsib.on.ca

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