

# PubMed

**pubmed.gov**

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The National Library of Medicine updates the PubMed search interface, features and algorithms regularly. This PubMed workbook is current as of March 2, 2011.

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## **1. Course Information**

### **How To Use The PubMed Workbook**

The workbook was designed to teach novice PubMed users to become advanced PubMed searchers. To accomplish this goal, the workbook takes you step by step through the numerous PubMed search options and features. PubMed screen captures along with bolded text have been included in the workbook to enhance the instructions. Lastly, notes added to the workbook provide further details about items of interest.

### **Where To Go For Help**

If you have any questions about the PubMed workbook or the PubMed database, please contact:

1. Sandra Halliday, B.Sc., M.Sc., M.L.I.S.  
Health Sciences Librarian  
Bracken Health Sciences Library  
Queen's University  
Kingston, Ontario

Email Address: [halliday@queensu.ca](mailto:halliday@queensu.ca)  
Telephone: 613-533-6000 ext. 77568

2. Alternatively, there is an excellent online PubMed tutorial available at the following web address: <http://www.nlm.nih.gov/bsd/disted/pubmed.html>.

### **Workbook Due Date**

Please complete the PubMed workbook prior to your selected teleconference date.

### **Teleconference Date**

Please check the course schedule for the dates and times of the teleconference sessions where you can discuss the PubMed workbook and the PubMed database. If you have any questions about the assigned teleconference date contact Sandra Halliday.

### **Course Evaluation**

Post on the class bulletin board your evaluation of the PubMed course 24 hours following your teleconference. In your evaluation discuss at least three features that you found useful in PubMed and briefly highlight how you will incorporate what you learned into your everyday practice. Of course, suggestions or comments about the workbook are welcomed.

## **2. Goal**

To encourage health care professionals to develop effective and efficient searching skills in the National Library of Medicine's PubMed database.

### **Objectives**

On completion of this workbook, you will have learned:

- about the literature search process for the practice of Evidence-Based Health Care;
- the PubMed database structure and the importance of the controlled vocabulary;
- how to use the MeSH (medical subject heading) terms for searching PubMed;
- how to search PubMed and use the numerous database searching options such as the "Limits", "Clipboard" and "History" features;
- how to use PubMed resources and tools such as the "MeSH (medical subject heading) Database", "Journals in NCBI Databases", the "Single Citation Matcher"; and
- how to set-up an alert service with "My NCBI".

### **3. Evidence-Based Health Care**

#### **Three Definitions Of Evidence-Based Health Care<sup>1</sup>**

1. A process of health care decision-making based on clinical experience and formal education using current evidence from the published literature.
2. The process of systematically finding, appraising, and using contemporaneous research findings as the basis for clinical decisions.
3. The conscientious, explicit, and judicious use of current best evidence in making decisions about the care of individual patients.

It is important to note that evidence-based health care builds on and reinforces, but never replaces, clinical skills, clinical judgment and clinical experience. Individual clinical expertise combined with the best available external, relevant evidence from systematic research must be applied appropriately in making decisions about individual patient care.

#### **Five Steps Of Evidence-Based Health Care<sup>2</sup>**

1. Define the question that needs to be answered.
2. Collect the evidence to answer the question.
3. Critically appraise the evidence gathered for its validity and relevance.
4. Integrate the evidence and patient factors to make and carry out the decision.
5. Evaluate the whole process with a view to improving future decision-making.

Evidence-based health care involves taking a systematic approach to the literature, beginning with formulating a question, developing search strategies to fit the appropriate tools selected, evaluating the findings for validity and relevance, then applying the evidence and evaluating the overall performance/outcomes.

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<sup>1</sup> McKibbin , A et al. 1999. *PDQ: evidence-based principles and practice*. Hamilton, ON: B.C. Decker Inc., p. 2.

<sup>2</sup> Ibid, p.2-3

## 4. The Literature Search Process: An Overview

### 1. Define your topic.

At the start of the research process the topic is often broad and requires refinement. The next step, looking for background information, will help with formulating a specific question.

### 2. Look for background information.

Background information provides foundation knowledge on a topic, and is found mostly in books, texts and/or review articles. These materials are generally collaborative efforts, written by experts in the field, and can usually be assumed to reflect peer consensus on the topic.

As well, background information will:

- help prepare you for the information you will find in the journal literature.
- help generate a list of keywords to plan your journal literature search.
- provide bibliographies of relevant materials.

### 3. Formulate your specific question.

State your information need as an answerable question. A clinical question should incorporate at least three elements and it is often referred to by the acronym - PICO:

- a. **Patient** – describe the patient as a member of a population group in terms of age, sex, ethnicity, etc. or in terms of their disease or general health condition.
- b. **Intervention** – course of action to be carried out on the patient (e.g. patient education, diagnostic tests, treatment, self-care etc.)
- c. **Comparison Intervention (not required)** – what is the main alternative to compare with the intervention (e.g. comparing two drugs).
- d. **Expected Outcome** – keep in mind what is the anticipated effect of the intervention on the patient.

**Sample clinical question:**

In patients with soft tissue lacerations, is the use of clean non-sterile gloves for the repair of lacerations as safe as sterile gloves?

<b>Patient Description</b>	<b>Intervention</b>	<b>Comparison Intervention</b>	<b>Outcome</b>
Patients with soft tissue lacerations	Clean non-sterile gloves to repair lacerations	Sterile gloves to repair lacerations	No difference in rate of wound infection (safe)

Defining your topic with a specific question will make it easier to formulate the search strategy, and enable you to evaluate the results of your search quickly.

**Note:**

Not all questions are of a clinical nature. The term “intervention” is taken very broadly.

**4. Look for specific information**

Specific information is most often found in journal articles or other primary sources. These primary sources are most efficiently accessed through resources such as journal indexes, databases, and bibliographies.

Specific information will:

- provide detailed information on your topic to further your knowledge found in books and review articles.
- provide you with further references.

**5. Evaluate your findings.**

Do they fulfill your information need(s)? Is your question answered?

- Modify your search strategy if necessary.
- Look for resources to fill in gaps or clarify other materials.

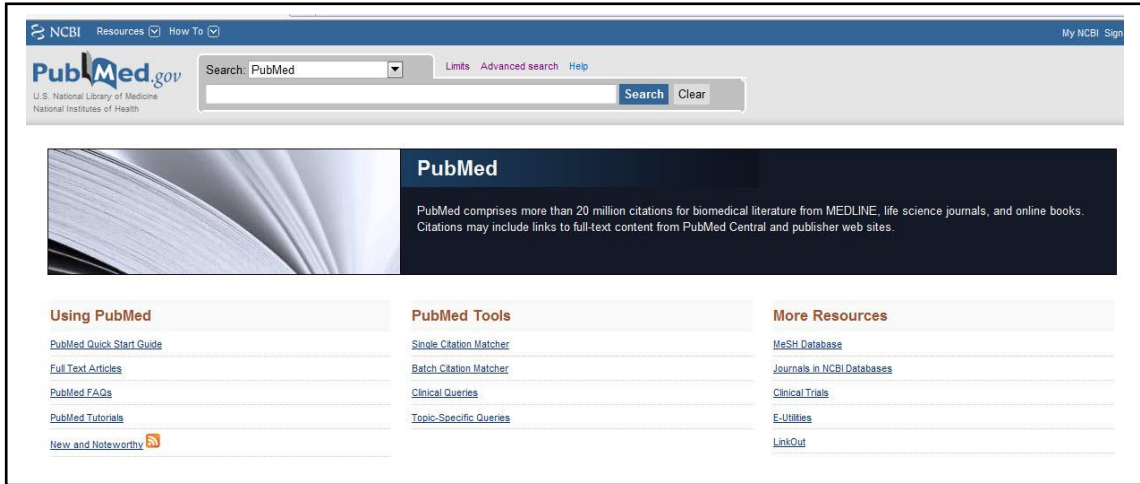
## 5. Six Top Reasons To Search PubMed

1. **PubMed - Premier bibliographic database for the health and life sciences fields** developed by the National Center for Biotechnology Information (NCBI) at the National Library of Medicine (NLM). It covers the following areas: medicine, nursing, dentistry, veterinary medicine, the health care system and the preclinical sciences.
2. **PubMed consists of 13 subsets:** AIDS, Bioethics, Cancer, Complementary Medicine, Core Clinical Journals, Dental Journals, Dietary Supplements, History of Medicine, Medline, Nursing Journals, Systematic Reviews, Toxicology and Veterinary Science. PubMed contains over 20 million citations to biomedical articles and some online books.
3. **PubMed contains the most current Medline database** because of its “in process citations”. The in process citations component is Medline’s “preliminary” database of records before they are indexed with MeSH terms. Medline and the in process citations are updated daily – Tuesday through Saturday.
4. **PubMed’s search interface is updated regularly.** For example, on February 14, 2011 it was announced: “The MeSH database was redesigned to provide the same streamlined interface now available in PubMed.”
5. **The PubMed search interface provides access to valuable PubMed resources and tools** – Journals in NCBI Databases, MeSH Database, Single Citation Matcher and My NCBI.
6. **PubMed is free on the Internet and links to free full text articles as well as books in the fields of health and life sciences.**

## 6. How To Access PubMed

1. PubMed can be accessed two ways on the Internet:
  - by typing the complete PubMed address in the address field on your web browser- <http://www.ncbi.nlm.nih.gov/pubmed/> or
  - by typing the PubMed shortcut in the address field on your web browser – **pubmed.gov**.
2. **Select one method and connect to the PubMed database.**

## 7. Tour Of The PubMed Search Screen



On the PubMed search screen there is:

- a page header
- blue bar that includes links to a list of **Resources**, a list of **How To** topics, and the option to **Sign In** the **My NCBI** feature;
- one search interface with search box;
- access to the **Limits**, **Advanced Search** and **Help** options;
- quick access to information about **Using PubMed**, **PubMed Tools**, and **More Resources**;
- a section to highlight featured information – currently PubMed information;
- an extensive list of National Center for Biotechnology Information (NCBI) resources; and
- a footer with contact information.

## 8. PubMed Options

Using PubMed	PubMed Tools	More Resources
<a href="#">PubMed Quick Start Guide</a>	<a href="#">Single Citation Matcher</a>	<a href="#">MeSH Database</a>
<a href="#">Full Text Articles</a>	<a href="#">Batch Citation Matcher</a>	<a href="#">Journals in NCBI Databases</a>
<a href="#">PubMed FAQs</a>	<a href="#">Clinical Queries</a>	<a href="#">Clinical Trials</a>
<a href="#">PubMed Tutorials</a>	<a href="#">Topic-Specific Queries</a>	<a href="#">E-Utilities</a>
<a href="#">New and Noteworthy</a> 		<a href="#">LinkOut</a>

Brief details about selected options are stated below.

### Using PubMed Section:

- **PubMed Quick Start Guide** provides brief information about common search questions such as “How do I search PubMed?” and “How do I search by author?” Online tutorials are available for some of the topics.
- **Full Text Articles** provides options for retrieving the full text of journal articles (e.g. your medical library, PubMed Central, publishers’ web sites etc.).
- **PubMed FAQs** provides information about frequently asked questions.
- **PubMed Tutorials** contains comprehensive web based instruction programs that provide detailed information about searching PubMed.
- **New and Noteworthy** lists news about the PubMed database. A great resource to use to keep current with PubMed enhancements and changes.

### PubMed Tools Section:

- **Single Citation Matcher** program allows you to verify a journal article citation.
- **Batch Citation Matcher** program retrieves citation id numbers. (Not required for the course.)
- The **Clinical Queries** page has three options: built-in search “filters” that utilize evidence-based medicine principles (e.g. etiology, diagnosis, therapy, and prognosis variables as well as clinical prediction guides), a search option for retrieving systematic reviews and a medical genetics search option.
- Numerous **Topic-Specific Queries** have been developed for PubMed and this link provides access to the complete listing.

### More Resources Section:

- The **MeSH Database** provides access to MeSH (medical subject heading) terminology including term definitions, subheadings, and tree structures. Searches can be posted from the MeSH database.
- The **Journals in NCBI Databases** allows you to look up journal titles as well as journal abbreviations in PubMed.
- The **Clinical Trials** link provides quick access to the database that reports on the clinical trials conducted in the United States as well as other international sites.
- **E-Utilities.** (Not required for the course.)
- The **LinkOut** option provides access to web based information such as full text publications, consumer health information and practice guidelines.

## 9. Tips For Creating An Effective Search Strategy

1. Identify your key concepts.
2. Create a list of alternate terms for the key concepts in case you need to explore other ways to describe the main concepts.
3. Know when to use the Boolean operators “**AND**” and “**OR**” to combine concepts.
  - When the Boolean operator “**AND**” is used to combine two terms, it means that only articles with **both** those concepts are present in the resulting set (e.g. cross infection and health care costs).
  - When the Boolean operator “**OR**” is used to combine two terms, it means that **all** the articles with either of those terms are present in the resulting set (e.g. cross infection or hospital infection).
4. Apply search limits as appropriate (e.g. English language, date range, publication type, age limit etc.).
5. Once you are familiar with all the PubMed search options and features, you will develop your own searching style.

## 10. How To Search PubMed

PubMed has been designed for both the novice and advanced users. For the novice user simply type your search strategy, include Boolean operators if required, and click on the “Search” button. An algorithm exists to translate your search query and retrieve information on your topic.

### Note:

This workbook has been designed to show you how to become an advanced searcher. You will become knowledgeable about the MeSH Database and the many PubMed search options. The end result is that your information seeking skills will be enhanced and you will save time searching for information.

## 11. Controlled Vocabulary And Indexing

The **Medical Subject Heading (MeSH)** is of particular importance to the PubMed database. The MeSH terms, also known as descriptors or index terms, form the **controlled vocabulary** used by the National Library of Medicine’s indexers. There are over 26,142 MeSH terms and they are updated annually.

How are the MeSH terms applied? The indexers read the articles from the journals covered in the PubMed database and they assign the MeSH terms that best describe the content of the article. It is highly recommended as a searcher that you use the MeSH terms in PubMed to retrieve all the information about a topic. For example, the subjects cross infection, hospital infections and nosocomial infections are covered by the MeSH term **cross infection**.

The indexing process can take several weeks between publication date and date of entry into the database. However, the most current information can be retrieved by conducting a “keyword” search for Medline’s “In Process Citations”. Keyword searching will be discussed later in the workbook.

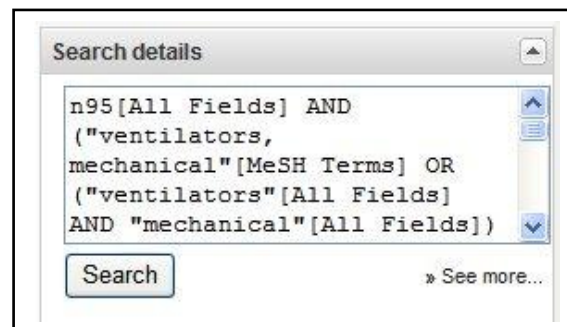
## 12. PubMed Searching – Novice User

### Clinical Question #1:

When health care professionals wear the N95 respirators, does it prevent the transmission of respiratory infections among hospitalized patients and other staff?



1. The single PubMed search interface is available on every screen. To begin a PubMed search **type** your term(s) in the query box – **n95 respirators and respiratory infection and transmission**. Then **click** on the **Search** button to run the search.
2. On March 2, 2011 when this search was conducted the number of citations retrieved was thirty-one. To determine exactly how the PubMed algorithm interpreted your search, **locate** the **Search details** box on the right side of the screen. Take a moment to review the actual PubMed search strategy to see how it differed from the initial search.



3. Since the amount of information published on this topic is minimal, the broad scope of the PubMed novice search will not retrieve too much information to handle.
4. If you are interested in exploring the content of any of the articles **click** directly on the **title of the article** hypertext link.

## 13. PubMed Searching – Advanced Searcher

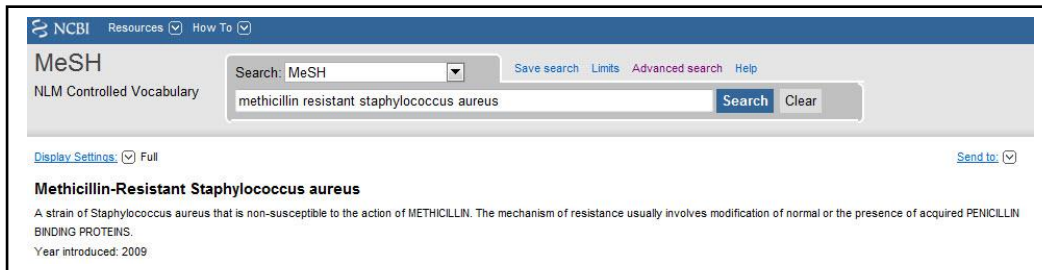
### Clinical Question #2:

What treatments are effective in the eradication and decolonization of methicillin resistant staphylococcus aureus in patients?

### 13a. The MeSH Database



1. For the advanced search we first have to find the appropriate MeSH terms. Return to the main PubMed page by **clicking** on the large **PubMed logo** at the top of the screen or by **clicking** on the **back button** until you return to the main screen.



2. On the right hand side of the PubMed screen **locate** the heading **More Resources** and **click** on the **MeSH Database** option. Read the information on the screen. Next in the **MeSH search box** type **methicillin resistant staphylococcus aureus** and **click** on the **Search** button.
3. The computer has performed a mapping – meaning it tried to map the term that you typed to a corresponding medical subject heading. The computer mapped to the subject heading “Methicillin-Resistant Staphylococcus aureus”. Read the definition and view the full record.
4. “Methicillin-Resistant Staphylococcus aureus” (MRSA) was first introduced in the MeSH database in 2009.

## 13b. Subheadings And Previous Indexing

The screenshot displays the MeSH term page for "Methicillin-Resistant Staphylococcus aureus". The page includes a definition, a list of subheadings with checkboxes, and a PubMed search builder. The subheadings are organized into three columns:

- Column 1:  chemistry,  classification,  cytology,  drug effects,  enzymology
- Column 2:  genetics,  growth and development,  immunology,  isolation and purification,  metabolism
- Column 3:  pathogenicity,  physiology,  radiation effects,  ultrastructure,  virology

Additional options include "Restrict to MeSH Major Topic" and "Do not include MeSH terms found below this term in the MeSH hierarchy". The "Entry Terms" section lists "MRSA". The "Previous Indexing" section lists "Methicillin Resistance (1982-2008)" and "Staphylococcus aureus (1982-2008)". The "PubMed search builder" section includes a search box, "Add to search builder" button, "AND" dropdown, and "Search PubMed" button. The "All links from this record" section includes links to PubMed, PubMed - Major Topic, Clinical Queries, and NLM MeSH Browser. The "Search details" section shows the search query: "methicillin-resistant staphylococcus aureus"[MeSH Terms] OR methicillin resistant staphylococcus aureus[Text Word].

1. The MeSH screen for “Methicillin-Resistant Staphylococcus aureus” contains a number of options that will be explained in detail.
2. Following the MeSH term definition is a list of subheadings that can be applied to “Methicillin-Resistant Staphylococcus aureus” (e.g. drug effects, genetics, immunology, physiology and radiation effects). Think of a subheading as an aspect of the main term. For example, if you were only interested in the genetics of “Methicillin-Resistant Staphylococcus aureus”, you would place a tick before the “genetics” subheading.

### Note:

If you want to read the definitions of the subheadings click directly on the “Subheadings” hypertext link.

3. By default all the subheadings will be included in the search unless you select individual terms. Do not select individual subheadings for this example.
4. **Scroll down** the screen until you **view** the **Previous Indexing** section. The previous indexing details how “Methicillin-Resistant Staphylococcus aureus” was described over the years.

For example: Methicillin Resistance (1982-2008)  
Staphylococcus aureus (1982-2008)

Previous indexing is important if the MeSH term is new and if you require a comprehensive search on your topic. For our search strategy we will have to incorporate the previous indexing to obtain information prior to 2009.

### 13c. Tree Structure



1. **Scroll further down** the page to **view the Tree Structure** for the MeSH term **Methicillin-Resistant Staphylococcus aureus**.
2. The Tree Structure provides a visual representation of how MeSH terms are related to one another. The Tree Structure brings together terms with at least one aspect in common and displays them in a hierarchical structure. The Tree begins with the broadest MeSH term – Organisms Category - and ends with the most specific MeSH term – Methicillin-Resistant Staphylococcus aureus. There can be more than one tree for a subject heading.

**Note:**

You can click on any of the terms in the Tree to access the MeSH page for that term.

### 13d. Restrict to MeSH Major Topic

1. **Scroll up** the screen to **view two check boxes** – **Restrict to MeSH Major Topic** and **Do not include MeSH terms found below this term in the MeSH hierarchy**.
2. “The Restrict to MeSH Major Topic” provides you with the opportunity to retrieve articles where the stated term (e.g. Methicillin-Resistant Staphylococcus aureus) is a main topic or focus of the article.
3. For this search **do not select** the option **Restrict to MeSH Major Topic** as we will be adding more MeSH terms to the search strategy further in the workbook.

#### Note:

Do not use this feature unless you know your final search result is going to be large.

### 13e. Do not include MeSH terms found below this term in the MeSH hierarchy

1. PubMed has been programmed to automatically “explode” a MeSH term in a search. This means that if a given term has other MeSH terms indented under it in the Tree Structure, the more specific terms will be automatically included. If you did not want the “explode” operation to occur, you would select the “Do not include MeSH terms found below this term in the MeSH hierarchy” option.
2. Let’s **view** the **tree structure** for **Methicillin-Resistant Staphylococcus aureus** again. **Scroll down** the screen and you will see that there are not any MeSH terms indented under it. For this search **do not select** the option **Do not include MeSH terms found below this term in the MeSH hierarchy** as it is redundant.

## 13f. Building The Search Strategy

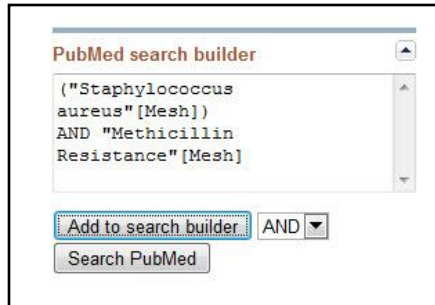


1. With the MeSH record displayed for **Methicillin-Resistant Staphylococcus aureus** find the heading on the right side of the screen “**All links from this record**”. Next **click** on the **PubMed** option. The MeSH term methicillin-resistant staphylococcus aureus will be searched in the PubMed database.

TIP: The goal is to create the following search strategy – Methicillin-Resistant Staphylococcus aureus or (Staphylococcus aureus and Methicillin Resistance). So, we must access the MeSH database again to select terms to search for information in PubMed prior to 2009.

2. Once again, **click** on the **PubMed logo** at the top of the screen and then select the **MeSH Database** option.
3. Let’s search for the previous indexing terms Staphylococcus aureus and Methicillin Resistance. In the MeSH search box **type Staphylococcus aureus** and then **click** on the **Search** button.
4. Moving along, we will walk through similar steps that were used for the previous MeSH search. Staphylococcus aureus is a MeSH term and it is the first term listed with a definition. Read the definition and then **click** on the blue **Staphylococcus aureus** hypertext link.
5. Note the options available on the full “Staphylococcus aureus” MeSH screen: list of subheadings, restrict to MeSH major topic, do not include MeSH terms found below this term in the MeSH hierarchy, previous indexing and the tree structure.
6. Review the record for **Staphylococcus aureus**. **Find the PubMed search builder box** on the right side of the screen so that we can continue to build the search strategy. We want to insert this subject heading in the PubMed search builder box. **Find the Add to search builder** button and **click** on it. Staphylococcus aureus as a MeSH term should be added to the box.

- Next look for the MeSH term Methicillin Resistance. With the cursor in the MeSH search box **type Methicillin Resistance** and **click** on the **Search** button.
- Read the definition and scroll down the screen to look at the full record. Once again we want to add this term to the PubMed search builder box. To accomplish this task **click** on the option **Add to search builder**.



- In the expanded search box you will see that the MeSH term “Methicillin Resistance” has been added to the search strategy. Note that the Boolean operator AND is in upper case lettering. PubMed automatically makes this translation. With these two MeSH terms in place, **click** on the **Search PubMed** button to conduct the search.
- In order to complete the search we have two more subjects to deal with – eradication and decolonization. Neither of these terms is a medical subject heading, however, they are valuable concepts that need to be incorporated into the search strategy to answer clinical question #2 and to focus the search results.

**Note:**

Searching the PubMed database without using MeSH terms is called “keyword searching”.



- Looking at the PubMed Search screen you will see the search strategy "Staphylococcus aureus" AND "Methicillin Resistance"[MeSH] in the search box. **Click** on the **Clear** button so that we can continue building the search.
- In the cleared search box **type** the keyword **eradication** and **click** on the **Search** button. View the **Search details** box on the right of the screen to see how your search was interpreted – eradication [All Fields]. At this point in time the results

of the “eradication” search are not combined with any previous searches. We will perform this combining function later in the workbook.

**Note:**

There are different ways to conduct a search in PubMed and once you are familiar with the options, you can develop a style that meets your requirements.

13. Once again **click** on the **Clear** button so that we can search for the final variable. In the PubMed search box **type** the keyword **decolonization** and **click** on the **Search** button.



14. With all the MeSH terms and keywords in place – Methicillin-Resistant Staphylococcus aureus, Methicillin Resistance, Staphylococcus aureus, eradication, and decolonization - we need to find the PubMed page where we can combine the search results. At the top of the screen **locate** and **select** the **Advanced Search** option to access your search history.



15. **Locate** the **Search History** box and **click** on the link **Search History Instructions**. Read the five statements before reviewing your search history.
16. Your search history should contain the following: Search set numbers, Most Recent Queries, Time and Result. The Result column shows how many citations were found for a particular search.

17. There are different ways to combine searches and we will use the suggestion offered in the fifth statement in the Search History box. Remember to put the Boolean operators - OR, AND - in upper case letters. Next combine the following MeSH terms – “Methicillin-Resistant Staphylococcus aureus” OR (“Staphylococcus aureus” AND “Methicillin Resistance”). In my case they are searches #12 as well as #13.
18. Moving along, **locate** the PubMed **search box** and **click** on the **Clear** button. **Type** the search statement **#12 OR #13** and then **click** on the **Search** button.

**Note:**

Do not click on the “Clear History” button located at the bottom of the Search History box.

19. You have searched for and combined all the relevant information about Methicillin-Resistant Staphylococcus aureus. Next we are going to incorporate the eradication search results with the total MRSA search results.
20. **Click** on the **Advanced Search** option again. Combine the total MRSA search (e.g. last search result) with eradication. In my case I would combine sets **#16 AND #14**. See the complete PubMed search history in Appendix A on page 29.
21. Glancing at the search results, (e.g. on March 2, 2011 this search retrieved 215 citations), we can utilize additional PubMed options to focus or decrease the number of citations required to answer clinical question #2.
22. **Click** on the **Limits** option. **Scroll down** the screen and **look at the available options**.

### 13g. Limits

The screenshot shows the 'Limits' section of a PubMed search interface. It contains several filterable categories, each with a list of options and checkboxes:

- Dates:** Published in the Last: [Any date]
- Type of Article:**
  - Clinical Trial
  - Editorial
  - Letter
  - Meta-Analysis
  - Practice Guideline
- Species:**
  - Humans
  - Animals
- Subsets:**
  - AIDS
  - Bioethics
  - Cancer
- Languages:**
  - English
  - French
  - German
  - Italian
  - Japanese
- Sex:**
  - Male
  - Female
- Ages:**
  - All Infant: birth-23 months
  - All Child: 0-18 years
  - All Adult: 19+ years

1. Next I will provide information about the limits, however, we will not use all of them in this search.
2. In the **Dates** box **click** on the **down arrow** in the **Any date** field and **select Specify date range**. To search by a specific date range, include a date in the format indicated. For this search **type** the year **2000** in the first year field and **2011** in the second year field.
3. Next let's view the array of publication types available in the **Type of Article** menu. Do not make any selection for this search.
4. From the **Languages** menu **select English**.
5. Since PubMed contains veterinary as well as animal experimental information, we will want to specify human. **Select** the **Humans** option from the **Species** menu.
6. If you are conducting research where gender designation is important, you can specify female or male. Do not make any selection for this search.
7. In the **Subsets** menu note the 13 options.
8. View the **Ages** menu. If you were researching a topic that was age specific, you could specify one or more age groups. For this search a specific age group is not required.
9. Next you have the option to select **Links to full text**, **Links to free full text** and **Abstracts**. For this search do not select any of these options.
10. With these **three limits** in place – Published date 2000 to 2011, Humans and English – **click** on the Search button located at the end of the Limits page. The number of citations retrieved is quite manageable - (e.g on March 2, 2011 one hundred and thirty-five citations were retrieved).
11. Lastly, **clear** the **main PubMed search box** located at the top of the screen and **click** on the **Advanced search** option. Combine the last two searches - (e.g the total MRSA search) and decolonization - keeping the identical limits.

### **Instructions:**

For the next section you can work with the search results from either of the last two searches: (1) total MRSA search AND Eradication or (2) total MRSA search AND Decolonization. For the workbook I will use the search results from search number two (e.g. 103 citations retrieved on March 2, 2011).

## 14. Working With The Search Results

### 14a. Display Formats

PubMed.gov  
U.S. National Library of Medicine  
National Institutes of Health

Search: PubMed  
#16 AND #15 Search Clear

Display Settings: Summary, 20 per page, Sorted by Recently Added

Limits Activated: Humans, English, Publication Date from 2000 to 2011

Results: 1 to 20 of 103 Page 1 of 8

1. [Prevention of methicillin-resistant Staphylococcus aureus infection: is Europe winning the fight?](#)  
Struelens MJ, Monnet DL.  
Infect Control Hosp Epidemiol. 2010 Nov;31 Suppl 1:S42-4.  
PMD: 20929368 [PubMed - indexed for MEDLINE]  
[Related citations](#)
2. [Methicillin-resistant Staphylococcus aureus and vancomycin-resistant enterococcus: recognition and prevention in intensive care units.](#)  
Lin MY, Hayden MK.  
Crit Care Med. 2010 Aug;38(8 Suppl):S335-44. Review.  
PMD: 20647791 [PubMed - indexed for MEDLINE]  
[Related citations](#)

1. Once PubMed runs your search, the retrieved citations will be displayed (20 citations by default per page) in the **summary** format. The default display of the results provides minimal information about the articles. Each record in the **summary** format may include the author name(s), title, journal source, and PubMed unique identifiers. Additional notations will appear for the following type of citations:
  - a. Citations transmitted electronically from the publisher to PubMed will display [**PubMed – as supplied by publisher**].
  - b. In process citations will display [**PubMed – in process**].
  - c. Non-English citations will display a language note, e.g. **French**.
  - d. The publication type for review articles or a retracted publication will be noted as **Review** or **Retracted publication**.
2. To view the other page of citations, **click** on the **Next** link. The “Next” link is located on the top and bottom right side of the screen.
3. Alternatively, on the search results page to increase the number of citations displayed on a page (200 maximum), **click** on the **Display Settings** link to view the **drop down menu** and **select a number higher** than your total retrieval. Then **click** on the **Apply** button. PubMed will then redisplay the citations based on your selection.

PubMed.gov  
U.S. National Library of Medicine  
National Institutes of Health

Search: PubMed RSS

Display Settings: Summary, 200 per page, Sorted by Recently Added

## Note:

You can only print from one display page at a time - up to 200 citations. Furthermore, 10,000 is the maximum number of citations that can be saved on a memory stick or a computer hard drive.

4. To change the default “Summary” format **click** on the **Display Settings drop down menu** again to view the possible formats.
  - **Abstract:** journal source, title, author(s), affiliation, abstract and PMID. Once you select the abstract format, you will have access to the full text of the article if it is available, links to related articles and the MeSH terms used to describe the content of the article.
  - **Medline:** two character tagged field MEDLINE format for the full record. Use this format for importing into bibliographic management software (e.g. Reference Manager).
5. **Select** the **Abstract** format and **click** on **Apply**. Then **scroll** down the page to **view the citations** in their new format.
6. **Choose any citation** and **click** on the link to the “**MeSH Terms**” to view them.

## 14b. Selecting Citations To Print Or Save

1. To select individual citations click on the check box to the left of each item. If you do not make any selections, PubMed will assume you want to view or work with all the citations. **For this exercise select three citations that interest you by placing a tick in three check boxes.**
2. Next we are going to work with the “Clipboard” feature. The Clipboard is a temporary storage space that will hold up to 500 citations. **Locate the Send to drop down menu** on the right top or bottom of the screen. **Click** on the **down arrow** to display the available options: File, Clipboard, Collections, E-Mail, Order and My Bibliography. Finally, **select the Clipboard** option and then **click** on the **Add to Clipboard** button to complete the task.
3. After the selected citations have been sent to the “Clipboard” you will see a brief message telling you how many citations were sent, that citations will remain on the “Clipboard” for up to eight hours after you stop searching PubMed, and the number of citations permitted in this space is 500. If you are conducting research on a number of topics, you can send your selected results to the Clipboard to be printed when you are ready.
4. To print your citations from the Clipboard **go to the clipboard section added on the right side of the screen** and **click** on the link telling you the **number of**

**stored citations.** Once on the Clipboard simply **click** on the Internet browser's **print icon** to print the citations.

5. To save your citations to a "File" return to the **Send to pull down menu** option and **select File**. Additional options will appear, (e.g. format and sort by). Make your selections and **click** on the **Create File** option. A dialogue box will appear and **click** on the **Save** option. Next a dialogue box will provide you with the option to **save your file** in a designated space.

**Note:**

If you are using a pop-up blocker on your computer, you will have to disable it in order to save your citations to a file.

6. Lastly, PubMed provides you with the option to e-mail the search results from the "results page" or from the Clipboard by **selecting the e-mail option** on the **Send to pull down menu**.

## 15. Selected PubMed Services

Three PubMed Services will be highlighted in this workbook: Journals in NCBI Databases, Single Citation Matcher and My NCBI.

### 15a. Journals in NCBI Databases

#### NLM Catalog: Journals referenced in the NCBI Databases

Limit your NLM Catalog search to the subset of journals that are referenced in NCBI database records

Enter topic, journal title or abbreviation, or ISSN: [Limits](#) [Advanced Search](#) [Help](#)

**More Resources**

[Search NLM Catalog](#) for the comprehensive set of NLM's collections (including Journals in the NCBI Databases.)

[Browse MEDLINE Journals by broad subject terms](#)

[Journal lists by FTP](#)

[LinkOut journal lists](#)

1. Return to the main PubMed page by **clicking** on the large **PubMed logo**. Next, under the **More Resources** heading **select** the **Journals in NCBI Databases** option. Use this feature if you need to know either the abbreviated journal title or the complete journal title.
2. Scenario: You are publishing a paper and the guidelines for the author state that all journal titles in the bibliography must be in an abbreviated format. To find an abbreviated journal title, conduct this sample search. In the search field **type** the name of the following journal - **Infection Control and Hospital Epidemiology** - and then **click** on the **Search** button.
3. In the entry look for the Title Abbreviation field to see the abbreviated journal title. Answer: Infect Control Hosp Epidemiol
4. Alternatively, if you only have the abbreviated journal title and need to know the complete title conduct the following search. **Clear the search field and type Clin Infect Dis**. Next **click** on the **Search** button. Answer: Clinical Infectious Diseases

## 15b. Single Citation Matcher

### PubMed Single Citation Matcher

- Use this tool to find PubMed citations. You may omit any field.
- Journal may be the full title or the title abbreviation.
- For first and last author searching, use smith jc format.

Journal:

Date:  (month and day are optional)

Volume:  Issue:  First page:

Author name (see [help](#))

Only as first author    Only as last author

Title words:

1. Use the Single Citation Matcher when you want to verify a citation. The Single Citation Matcher is found on the PubMed main page under PubMed Tools.

**Scenario:** A colleague tells you that he read a recent article about a **hospital wide hand hygiene program** in the **Infection Control and Hospital Epidemiology** journal. Complete the form with the information that was provided and then click on the **Go** button. **Answer:**

Infect Control Hosp Epidemiol. 2011 Jan;32(1):59-66. Epub 2010 Dec 3.

**Dissemination and sustainability of a hospital-wide hand hygiene program emphasizing positive reinforcement.**

Mayer J, Mooney B, Gundlapalli A, Harbarth S, Stoddard GJ, Rubin MA, Eutropius L, Brinton B, Samore MH.  
Division of Epidemiology, University of Utah School of Medicine, Salt Lake City, Utah 84132, USA. jeanmarie.mayer@hsc.utah.edu

**Abstract**

**OBJECTIVE:** To increase and sustain hospital-wide compliance with hand hygiene through a long-term ongoing multidimensional improvement program emphasizing behavioral factors.

**DESIGN:** Quasi-experimental short study (August 2000–November 2001) and descriptive time series (April 2003–December 2006).

**SETTING:** A 450-bed teaching tertiary-care hospital.

**INTERVENTIONS:** An initial intervention bundle was introduced in pilot locations that addressed cognitive behavioral factors, which included access to alcohol sanitizer, education, and ongoing audit and feedback. The bundle was subsequently disseminated hospital-wide, along with a novel approach focused on behavior modification through positive reinforcement and annually changing incentives.

**RESULTS:** A total of 36,123 hand hygiene opportunities involving all categories of healthcare workers from 12 inpatient units were observed from October 2000 to October 2006. The rate of compliance with hand hygiene significantly improved after the intervention in 2 cohorts over the first year (from 40% to 64% of opportunities and from 34% to 49% of opportunities;  $P < .001$ , compared with the control group). Mean compliance rates ranged from 19% to 41% of 4174 opportunities (at baseline), increased to the highest levels of 73%–84% of 6,420 opportunities 2 years after hospital-wide dissemination, and remained improved at 59%–81% of 4,990 opportunities during year 6 of the program.

**CONCLUSION:** This interventional cohort study used a behavioral change approach and is one of the earliest and largest institution-wide programs promoting alcohol sanitizer from the United States that has shown significant and sustained improvements in hand hygiene compliance. This creative campaign used ongoing frequent audit and feedback with novel use of immediate positive reinforcement at an acceptable cost to the institution.

## 15c. My NCBI

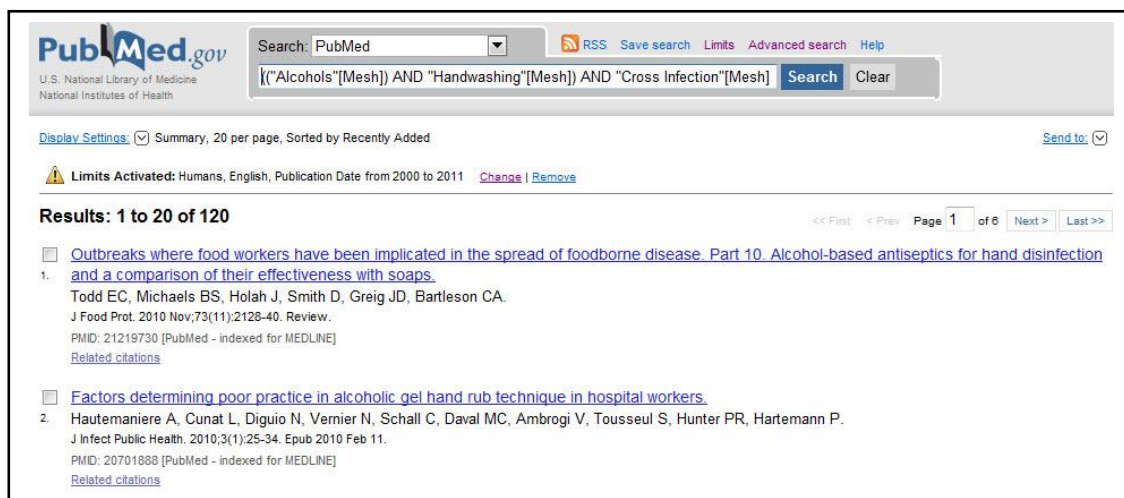
1. My NCBI is a feature that stores your search strategies and provides the option of setting up an e-mail alert service for new citations published in your areas of interest. To access the My NCBI feature you must register for it. There is no cost associated with using My NCBI, however, your computer system must be able to accept cookies.
2. Next we will conduct a PubMed search to find information to answer the following clinical question.

### Clinical Question #3:

Is the rate of nosocomial infections reduced for patients in health care institutions if alcohol hand sanitizer products are used?

The preferred approach is to find the MeSH terms for the main concepts.

- Alcohol sanitizer: corresponding MeSH term – alcohols
- Handwashing: corresponding MeSH term – handwashing
- Nosocomial Infections: corresponding MeSH term – cross infection



PubMed.gov  
U.S. National Library of Medicine  
National Institutes of Health

Search: PubMed  
RSS Save search Limits Advanced search Help

[("Alcohols"[Mesh]) AND "Handwashing"[Mesh]) AND "Cross Infection"[Mesh] Search Clear

Display Settings: Summary, 20 per page, Sorted by Recently Added Send to

Limits Activated: Humans, English, Publication Date from 2000 to 2011 Change Remove

Results: 1 to 20 of 120 Page 1 of 6

- [Outbreaks where food workers have been implicated in the spread of foodborne disease. Part 10. Alcohol-based antiseptics for hand disinfection and a comparison of their effectiveness with soaps.](#)  
Todd EC, Michaels BS, Holah J, Smith D, Greig JD, Bartleson CA.  
J Food Prot. 2010 Nov;73(11):2128-40. Review.  
PMID: 21219730 [PubMed - indexed for MEDLINE]  
[Related citations](#)
- [Factors determining poor practice in alcoholic gel hand rub technique in hospital workers.](#)  
Hautemaniere A, Cunat L, Diguio N, Vernier N, Schall C, Daval MC, Ambrogi V, Tousseul S, Hunter PR, Hartemann P.  
J Infect Public Health. 2010;3(1):25-34. Epub 2010 Feb 11.  
PMID: 20701888 [PubMed - indexed for MEDLINE]  
[Related citations](#)

3. On the main PubMed web page under the heading More Resources select the MeSH Database option to **build the search strategy**. On March 2, 2011 one hundred and twenty citations were retrieved with the addition of the English language, year range (2000 – 2011) and humans limits.
4. To send this search strategy to My NCBI **click** on the **Save Search** option located close to the PubMed search box. If you are a first time user you must **register for an account**. However, if you have previously used the My NCBI simply **sign in**.
5. Once you have accessed My NCBI, you have the option to **name** your search and **set up a schedule** to receive email updates.
6. If you are interested **return** to the **search results** to **review** the 120 retrieved citations.

## Appendix A. Total PubMed Search Strategy

Search History		
Search	Most Recent Queries	Time Result
#22	Search ("Alcohols"[Mesh]) AND "Handwashing"[Mesh] AND "Cross Infection"[Mesh] Limits: Humans, English, Publication Date from 2000 to 2011	15:40:58 120
#19	Search #16 AND #15 Limits: Humans, English, Publication Date from 2000 to 2011	15:30:01 103
#18	Search #16 AND #14 Limits: Humans, English, Publication Date from 2000 to 2011	15:28:59 135
#17	Search #16 AND #14	15:23:49 215
#16	Search #12 OR #13	15:17:01 9948
#15	Search decolonization	15:16:12 229
#14	Search eradication	15:16:06 23757
#13	Search ("Staphylococcus aureus"[Mesh]) AND "Methicillin Resistance"[Mesh]	15:15:57 7425
#12	Search "Methicillin-Resistant Staphylococcus aureus"[Mesh]	15:15:06 2744
#10	Search n95 respirators and respiratory infection and transmission	15:14:48 31

[Less History](#) [Clear History](#)  
[Search History Instructions](#)