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## HICPAC GUIDELINE

# Guideline for Prevention of Catheter-Associated Urinary Tract Infections 2009

Carolyn V. Gould, MD, MSCR; Craig A. Umscheid, MD, MSCE; Rajender K. Agarwal, MD, MPH; Gretchen Kuntz, MSW, MSLIS; David A. Pegues, MD; and the Healthcare Infection Control Practices Advisory Committee (HICPAC)

## EDITOR'S NOTE

Following are the Executive Summary, Summary of Recommendations, and Implementation and Audit sections. The references for the entire guideline are available in the online edition of the journal. The entire guideline and the full citation apparatus have been previously published by HICPAC and are available at <http://www.cdc.gov/hicpac/>.

## I. EXECUTIVE SUMMARY

This guideline updates and expands the original Centers for Disease Control and Prevention (CDC) Guideline for Prevention of Catheter-Associated Urinary Tract Infections (CAUTI) published in 1981. Several developments necessitated revision of the 1981 guideline, including new research and technological advancements for preventing CAUTI, increasing need to address patients in nonacute care settings and patients requiring long-term urinary catheterization, and greater emphasis on prevention initiatives as well as better defined goals and metrics for outcomes and process measures. In addition to updating the previous guideline, this revised guideline reviews the available evidence on CAUTI prevention for patients requiring chronic indwelling catheters and individuals who can be managed with alternative methods of urinary drainage (eg, intermittent catheterization). The revised guideline also includes specific recommendations for implementation, performance measurement, and surveillance. Although the general principles of CAUTI prevention have not changed from the previous version, the revised guideline provides clarification and more specific guidance based on a defined, systematic review of the literature through July 2007. For areas where knowledge gaps exist, recommendations for further research are listed. Finally, the revised guideline outlines high-priority recommendations for CAUTI prevention in order to offer guidance for implementation.

This document is intended for use by infection prevention

staff, healthcare epidemiologists, healthcare administrators, nurses, other healthcare providers, and persons responsible for developing, implementing, and evaluating infection prevention and control programs for healthcare settings across the continuum of care. The guideline can also be used as a resource for societies or organizations that wish to develop more detailed implementation guidance for prevention of CAUTI.

Our goal was to develop a guideline based on a targeted systematic review of the best available evidence, with explicit links between the evidence and recommendations. To accomplish this, we used an adapted GRADE system approach for evaluating quality of evidence and determining strength of recommendations. The methodology, structure, and components of this guideline are approved by HICPAC and will be used for subsequent guidelines issued by HICPAC. A more detailed description of our approach is available in the Methods section.

To evaluate the evidence on preventing CAUTI, we examined data addressing three key questions and related subquestions:

1. Who should receive urinary catheters?
  - A. When is urinary catheterization necessary?
  - B. What are the risk factors for CAUTI?
  - C. What populations are at highest risk of mortality related to urinary catheters?
2. For those who may require urinary catheters, what are the best practices?
 

Specifically, what are the risks and benefits associated with:

  - A. Different approaches to catheterization?
  - B. Different catheters or collecting systems?
  - C. Different catheter management techniques?
  - D. Different systems interventions (ie, quality improvement programs)?

From the Division of Healthcare Quality Promotion, Centers for Disease Control and Prevention, Atlanta, Georgia (C.V.G.); the Center for Evidence-Based Practice, University of Pennsylvania Health System, Philadelphia (C.A.U., R.K.A., G.K.); and the Division of Infectious Diseases, David Geffen School of Medicine at University of California, Los Angeles (D.A.P.). Members of HICPAC are listed at the end of the text.

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TABLE 1. Modified HICPAC Categorization Scheme<sup>a</sup> for Recommendations

Category IA	A strong recommendation supported by high to moderate quality <sup>b</sup> evidence suggesting net clinical benefits or harms
Category IB	A strong recommendation supported by low quality evidence suggesting net clinical benefits or harms or an accepted practice (eg, aseptic technique) supported by low to very low quality evidence
Category IC	A strong recommendation required by state or federal regulation
Category II	A weak recommendation supported by any quality evidence suggesting a trade-off between clinical benefits and harms
No recommendation/unresolved issue	Unresolved issue for which there is low to very low quality evidence with uncertain trade offs between benefits and harms

<sup>a</sup> Please refer to Methods (p 32) for implications of Category designations.

<sup>b</sup> Please refer to Methods (p 29–30) for process used to grade quality of evidence.

### 3. What are the best practices for preventing CAUTI associated with obstructed urinary catheters?

Evidence addressing the key questions was used to formulate recommendations, and explicit links between the evidence and recommendations are available in the Evidence Review in the body of the guideline and Evidence Tables and GRADE Tables in the Appendices. It is important to note that Category I recommendations are all considered strong recommendations and should be equally implemented; it is only the *quality* of the evidence underlying the recommendation that distinguishes between levels A and B. Category IC recommendations are required by state or federal regulation and may have any level of supporting evidence. The categorization scheme used in this guideline is presented in Table 1 in the Summary of Recommendations and described further in the Methods section.

The Summary of Recommendations is organized as follows: (1) recommendations for who should receive indwelling urinary catheters (or, for certain populations, alternatives to indwelling catheters); (2) recommendations for catheter insertion; (3) recommendations for catheter maintenance; (4) quality improvement programs to achieve appropriate placement, care, and removal of catheters; (5) administrative infrastructure required; and (6) surveillance strategies.

The Implementation and Audit section includes a prioritization of recommendations (ie, high-priority recommendations that are essential for every healthcare facility), organized by modules, in order to provide facilities more guidance on implementation of these guidelines. A list of recommended performance measures that can potentially be used for internal reporting purposes is also included.

Areas in need of further research identified during the evidence review are outlined in the Recommendations for Further Research. This section includes guidance for specific methodological approaches that should be used in future studies.

Readers who wish to examine the primary evidence underlying the recommendations are referred to the Evidence Review in the body of the guideline, and the Evidence Tables and GRADE Tables in the Appendices. The Evidence Review

includes narrative summaries of the data presented in the Evidence Tables and GRADE Tables. The Evidence Tables include all study-level data used in the guideline, and the GRADE Tables assess the overall quality of evidence for each question. The Appendices also contain a clearly delineated search strategy that will be used for periodic updates to ensure that the guideline remains a timely resource as new information becomes available.

TABLE 2. Examples of Appropriate and Inappropriate Indications for Indwelling Urethral Catheter Use

A. Examples of <i>appropriate</i> indications for indwelling urethral catheter use	
	Patient has acute urinary retention or bladder outlet obstruction
	Need for accurate measurements of urinary output in critically ill patients
	Perioperative use for selected surgical procedures:
	Patients undergoing urologic surgery or other surgery on contiguous structures of the genitourinary tract
	Anticipated prolonged duration of surgery (catheters inserted for this reason should be removed in post-anesthesia care unit)
	Patients anticipated to receive large-volume infusions or diuretics during surgery
	Need for intraoperative monitoring of urinary output
	To assist in healing of open sacral or perineal wounds in incontinent patients
	Patient requires prolonged immobilization (eg, potentially unstable thoracic or lumbar spine, multiple traumatic injuries such as pelvic fractures)
	To improve comfort for end-of-life care if needed
B. Examples of <i>inappropriate</i> uses of indwelling catheters	
	As a substitute for nursing care of the patient or resident with incontinence
	As a means of obtaining urine for culture or other diagnostic tests when the patient can voluntarily void
	For prolonged postoperative duration without appropriate indications (eg, structural repair of urethra or contiguous structures, prolonged effect of epidural anaesthesia, etc)

NOTE. These indications are based primarily on expert consensus.

## II. SUMMARY OF RECOMMENDATIONS

### I. Appropriate Urinary Catheter Use

A. Insert catheters only for appropriate indications (see Table 2 for guidance), and leave in place only as long as needed. (Category IB) (Key Questions 1B and 2C)

1. Minimize urinary catheter use and duration of use in all patients, particularly those at higher risk for CAUTI or mortality from catheterization such as women, the elderly, and patients with impaired immunity. (Category IB) (Key Questions 1B and 1C)

2. Avoid use of urinary catheters in patients and nursing home residents for management of incontinence. (Category IB) (Key Question 1A)

a. Further research is needed on periodic (eg, nighttime) use of external catheters (eg, condom catheters) in incontinent patients or residents and the use of catheters to prevent skin breakdown. (No recommendation/unresolved issue) (Key Question 1A)

3. Use urinary catheters in operative patients only as necessary, rather than routinely. (Category IB) (Key Question 1A)

4. For operative patients who have an indication for an indwelling catheter, remove the catheter as soon as possible postoperatively, preferably within 24 hours, unless there are appropriate indications for continued use. (Category IB) (Key Questions 2A and 2C)

B. Consider using alternatives to indwelling urethral catheterization in selected patients when appropriate.

1. Consider using external catheters as an alternative to indwelling urethral catheters in cooperative male patients without urinary retention or bladder outlet obstruction. (Category II) (Key Question 2A)

2. Consider alternatives to chronic indwelling catheters, such as intermittent catheterization, in spinal cord injury patients. (Category II) (Key Question 1A)

3. Intermittent catheterization is preferable to indwelling urethral or suprapubic catheters in patients with bladder emptying dysfunction. (Category II) (Key Question 2A)

4. Consider intermittent catheterization in children with myelomeningocele and neurogenic bladder to reduce the risk of urinary tract deterioration. (Category II) (Key Question 1A)

5. Further research is needed on the benefit of using a urethral stent as an alternative to an indwelling catheter in selected patients with bladder outlet obstruction. (No recommendation/unresolved issue) (Key Question 1A)

6. Further research is needed on the risks and benefits of suprapubic catheters as an alternative to indwelling urethral catheters in selected patients requiring short- or long-term catheterization, particularly with respect to complications related to catheter insertion or the cath-

eter site. (No recommendation/unresolved issue) (Key Question 2A)

### II. Proper Techniques for Urinary Catheter Insertion

A. Perform hand hygiene immediately before and after insertion or any manipulation of the catheter device or site. (Category IB) (Key Question 2D)

B. Ensure that only properly trained persons (eg, hospital personnel, family members, or patients themselves) who know the correct technique of aseptic catheter insertion and maintenance are given this responsibility. (Category IB) (Key Question 1B)

C. In the acute care hospital setting, insert urinary catheters using aseptic technique and sterile equipment. (Category IB)

1. Use sterile gloves, drape, sponges, an appropriate antiseptic or sterile solution for periurethral cleaning, and a single-use packet of lubricant jelly for insertion. (Category IB)

2. Routine use of antiseptic lubricants is not necessary. (Category II) (Key Question 2C)

3. Further research is needed on the use of antiseptic solutions versus sterile water or saline for periurethral cleaning prior to catheter insertion. (No recommendation/unresolved issue) (Key Question 2C)

D. In the nonacute care setting, clean (ie, nonsterile) technique for intermittent catheterization is an acceptable and more practical alternative to sterile technique for patients requiring chronic intermittent catheterization. (Category IA) (Key Question 2A)

1. Further research is needed on optimal cleaning and storage methods for catheters used for clean intermittent catheterization. (No recommendation/unresolved issue) (Key Question 2C)

E. Properly secure indwelling catheters after insertion to prevent movement and urethral traction. (Category IB)

F. Unless otherwise clinically indicated, consider using the smallest bore catheter possible, consistent with good drainage, to minimize bladder neck and urethral trauma. (Category II)

G. If intermittent catheterization is used, perform it at regular intervals to prevent bladder overdistension. (Category IB) (Key Question 2A)

H. Consider using a portable ultrasound device to assess urine volume in patients undergoing intermittent catheterization to assess urine volume and reduce unnecessary catheter insertions. (Category II) (Key Question 2C)

1. If ultrasound bladder scanners are used, ensure that indications for use are clearly stated, nursing staff are trained in their use, and equipment is adequately cleaned and disinfected in between patients. (Category IB)

### III. Proper Techniques for Urinary Catheter Maintenance

A. Following aseptic insertion of the urinary catheter,

maintain a closed drainage system. (Category IB) (Key Question 1B and 2B)

1. If breaks in aseptic technique, disconnection, or leakage occur, replace the catheter and collecting system using aseptic technique and sterile equipment. (Category IB)

2. Consider using urinary catheter systems with pre-connected, sealed catheter-tubing junctions. (Category II) (Key Question 2B)

B. Maintain unobstructed urine flow. (Category IB) (Key Questions 1B and 2D)

1. Keep the catheter and collecting tube free from kinking. (Category IB)

2. Keep the collecting bag below the level of the bladder at all times. Do not rest the bag on the floor. (Category IB)

3. Empty the collecting bag regularly using a separate, clean collecting container for each patient; avoid splashing, and prevent contact of the drainage spigot with the nonsterile collecting container. (Category IB)

C. Use Standard Precautions, including the use of gloves and gown as appropriate, during any manipulation of the catheter or collecting system. (Category IB)

D. Complex urinary drainage systems (utilizing mechanisms for reducing bacterial entry such as antiseptic-release cartridges in the drain port) are not necessary for routine use. (Category II) (Key Question 2B)

E. Changing indwelling catheters or drainage bags at routine, fixed intervals is not recommended. Rather, it is suggested to change catheters and drainage bags based on clinical indications such as infection, obstruction, or when the closed system is compromised. (Category II) (Key Question 2C)

F. Unless clinical indications exist (eg, in patients with bacteriuria upon catheter removal post urologic surgery), do not use systemic antimicrobials routinely to prevent CAUTI in patients requiring either short or long-term catheterization. (Category IB) (Key Question 2C)

1. Further research is needed on the use of urinary antiseptics (eg, methenamine) to prevent UTI in patients requiring short-term catheterization. (No recommendation/unresolved issue) (Key Question 2C)

G. Do not clean the periurethral area with antiseptics to prevent CAUTI while the catheter is in place. Routine hygiene (eg, cleansing of the meatal surface during daily bathing or showering) is appropriate. (Category IB) (Key Question 2C)

H. Unless obstruction is anticipated (eg, as might occur with bleeding after prostatic or bladder surgery) bladder irrigation is not recommended. (Category II) (Key Question 2C)

1. If obstruction is anticipated, closed continuous irrigation is suggested to prevent obstruction. (Category II)

I. Routine irrigation of the bladder with antimicrobials is not recommended. (Category II) (Key Question 2C)

J. Routine instillation of antiseptic or antimicrobial solutions into urinary drainage bags is not recommended. (Category II) (Key Question 2C)

K. Clamping indwelling catheters prior to removal is not necessary. (Category II) (Key Question 2C)

L. Further research is needed on the use of bacterial interference (ie, bladder inoculation with a nonpathogenic bacterial strain) to prevent UTI in patients requiring chronic urinary catheterization. (No recommendation/unresolved issue) (Key Question 2C)

#### *Catheter Materials*

M. If the CAUTI rate is not decreasing after implementing a comprehensive strategy to reduce rates of CAUTI, consider using antimicrobial/antiseptic-impregnated catheters. The comprehensive strategy should include, at a minimum, the high priority recommendations for urinary catheter use, aseptic insertion, and maintenance (see Section III. Implementation and Audit). (Category IB) (Key Question 2B)

1. Further research is needed on the effect of antimicrobial/antiseptic-impregnated catheters in reducing the risk of symptomatic UTI, their inclusion among the primary interventions, and the patient populations most likely to benefit from these catheters. (No recommendation/unresolved issue) (Key Question 2B)

N. Hydrophilic catheters might be preferable to standard catheters for patients requiring intermittent catheterization. (Category II) (Key Question 2B)

O. Silicone might be preferable to other catheter materials to reduce the risk of encrustation in long-term catheterized patients who have frequent obstruction. (Category II) (Key Question 3)

P. Further research is needed to clarify the benefit of catheter valves in reducing the risk of CAUTI and other urinary complications. (No recommendation/unresolved issue) (Key Question 2B)

#### *Management of Obstruction*

Q. If obstruction occurs and it is likely that the catheter material is contributing to obstruction, change the catheter. (Category IB)

R. Further research is needed on the benefit of irrigating the catheter with acidifying solutions or use of oral urease inhibitors in long-term catheterized patients who have frequent catheter obstruction. (No recommendation/unresolved issue) (Key Question 3)

S. Further research is needed on the use of a portable ultrasound device to evaluate for obstruction in patients with indwelling catheters and low urine output. (No recommendation/unresolved issue) (Key Question 2C)

T. Further research is needed on the use of methena-

mine to prevent encrustation in patients requiring chronic indwelling catheters who are at high risk for obstruction. (No recommendation/unresolved issue) (Key Question 2C)

#### *Specimen Collection*

U. Obtain urine samples aseptically. (Category IB)

1. If a small volume of fresh urine is needed for examination (ie, urinalysis or culture), aspirate the urine from the needleless sampling port with a sterile syringe/cannula adapter after cleansing the port with a disinfectant. (Category IB)

2. Obtain large volumes of urine for special analyses (not culture) aseptically from the drainage bag. (Category IB)

#### *Spatial Separation of Catheterized Patients*

V. Further research is needed on the benefit of spatial separation of patients with urinary catheters to prevent transmission of pathogens colonizing urinary drainage systems. (No recommendation/unresolved issue) (Key Question 2D)

### IV. Quality Improvement Programs

A. Implement quality improvement (QI) programs or strategies to enhance appropriate use of indwelling catheters and to reduce the risk of CAUTI based on a facility risk assessment. (Category IB) (Key Question 2D)

The purposes of QI programs should be: (1) to assure appropriate utilization of catheters, (2) to identify and remove catheters that are no longer needed (eg, daily review of their continued need), and (3) to ensure adherence to hand hygiene and proper care of catheters. Examples of programs that have been demonstrated to be effective include:

1. A system of alerts or reminders to identify all patients with urinary catheters and assess the need for continued catheterization.

2. Guidelines and protocols for nurse-directed removal of unnecessary urinary catheters.

3. Education and performance feedback regarding appropriate use, hand hygiene, and catheter care.

4. Guidelines and algorithms for appropriate perioperative catheter management, such as:

a. Procedure-specific guidelines for catheter placement and postoperative catheter removal.

b. Protocols for management of postoperative urinary retention, such as nurse-directed use of intermittent catheterization and use of bladder ultrasound scanners.

### V. Administrative Infrastructure

A. Provision of guidelines

1. Provide and implement evidence-based guidelines that address catheter use, insertion, and maintenance. (Category IB)

a. Consider monitoring adherence to facility-based criteria for acceptable indications for indwelling urinary catheter use. (Category II)

B. Education and Training

1. Ensure that healthcare personnel and others who take care of catheters are given periodic in-service training regarding techniques and procedures for urinary catheter insertion, maintenance, and removal. Provide education about CAUTI, other complications of urinary catheterization, and alternatives to indwelling catheters. (Category IB)

2. When feasible, consider providing performance feedback to these personnel on what proportion of catheters they have placed meet facility-based criteria and other aspects related to catheter care and maintenance. (Category II)

C. Supplies

1. Ensure that supplies necessary for aseptic technique for catheter insertion are readily available. (Category IB)

D. System of documentation

1. Consider implementing a system for documenting the following in the patient record: indications for catheter insertion, date and time of catheter insertion, individual who inserted catheter, and date and time of catheter removal. (Category II)

a. Ensuring that documentation is accessible in the patient record and recorded in a standard format for data collection and quality improvement purposes is suggested. Electronic documentation that is searchable is preferable. (Category II)

E. Surveillance resources

1. If surveillance for CAUTI is performed, ensure that there are sufficient trained personnel and technology resources to support surveillance for urinary catheter use and outcomes. (Category IB)

### VI. Surveillance

A. Consider surveillance for CAUTI when indicated by facility-based risk assessment. (Category II)

1. Identify the patient groups or units on which to conduct surveillance based on frequency of catheter use and potential risk of CAUTI.

B. Use standardized methodology for performing CAUTI surveillance. (Category IB)

1. Examples of metrics that should be used for CAUTI surveillance include:

a. Number of CAUTI per 1,000 catheter-days

b. Number of bloodstream infections secondary to CAUTI per 1,000 catheter-days

c. Catheter utilization ratio: (urinary catheter days/patient days) x 100

2. Use CDC/NHSN criteria for identifying patients who have symptomatic UTI (SUTI) (numerator data) (see NHSN Patient Safety Manual: <http://www.cdc.gov/nhsn/library.html>).

3. For more information on metrics, please see the U.S. Department of Health & Human Services (HHS) Action Plan to Prevent Healthcare-Associated Infections: <http://www.hhs.gov/ophis/initiatives/hai/infection.html>.

C. Routine screening of catheterized patients for asymptomatic bacteriuria (ASB) is not recommended. (Category II) (Key Question 2D)

D. When performing surveillance for CAUTI, consider providing regular (eg, quarterly) feedback of unit-specific CAUTI rates to nursing staff and other appropriate clinical care staff. (Category II) (Key Question 2D)

### III. IMPLEMENTATION AND AUDIT

#### Prioritization of Recommendations

In this section, the recommendations considered essential for *all* healthcare facilities caring for patients requiring urinary catheterization are organized into modules in order to provide more guidance to facilities on implementation of these guidelines. The high-priority recommendations were chosen by a consensus of experts based on strength of recommendation as well as on the likely impact of the strategy in preventing CAUTI. The administrative functions and infrastructure listed above in the summary of recommendations are necessary to accomplish the high priority recommendations and are therefore critical to the success of a prevention program. In addition, quality improvement programs should be implemented as an active approach to accomplishing these recommendations and when process and outcome measure goals are not being met based on internal reporting.

#### Priority Recommendations for Appropriate Urinary Catheter Use (Module 1)

- Insert catheters only for appropriate indications (see Table 2), and leave in place only as long as needed. (Category IB)
  - Avoid use of urinary catheters in patients and nursing home residents for management of incontinence. (Category IB)
  - For operative patients who have an indication for an indwelling catheter, remove the catheter as soon as possible postoperatively, preferably within 24 hours, unless there are appropriate indications for continued use. (Category IB)

#### Priority Recommendations for Aseptic Insertion of Urinary Catheters (Module 2)

- Ensure that only properly trained persons (eg, hos-

pital personnel, family members, or patients themselves) who know the correct technique of aseptic catheter insertion and maintenance are given this responsibility. (Category IB)

- In the acute care hospital setting, insert catheters using aseptic technique and sterile equipment. (Category IB)

#### Priority Recommendations for Proper Urinary Catheter Maintenance (Module 3)

- Following aseptic insertion of the urinary catheter, maintain a closed drainage system (Category IB)
- Maintain unobstructed urine flow. (Category IB)

#### Performance Measures

A. Internal Reporting. Consider reporting both process and outcome measures to senior administrative, medical, and nursing leadership and clinicians who care for patients at risk for CAUTI. (Category II)

1. Examples of process measures:

a. Compliance with educational program: Calculate percent of personnel who have proper training:

- Numerator: number of personnel who insert urinary catheters and who have proper training
- Denominator: number of personnel who insert urinary catheters
- Standardization factor: 100 (ie, multiply by 100 so that measure is expressed as a percentage)

b. Compliance with documentation of catheter insertion and removal dates: Conduct random audits of selected units and calculate compliance rate:

- Numerator: number of patients on unit with catheters with proper documentation of insertion and removal dates
- Denominator: number of patients on the unit with a catheter in place at some point during admission
- Standardization factor: 100 (ie, multiply by 100 so that measure is expressed as a percentage)

c. Compliance with documentation of indication for catheter placement: Conduct random audits of selected units and calculate compliance rate

- Numerator: number of patients on unit with catheters with proper documentation of indication
- Denominator: number of patients on the unit with catheter in place
- Standardization factor: 100 (ie, multiply by 100 so that measure is expressed as a percentage)

2. Recommended outcome measures:

a. Rates of CAUTI: Use NHSN definitions (see <http://www.cdc.gov/nhsn/library.html>). Measurement of rates allows an individual facility to gauge the longitudinal impact of implementation of prevention strategies:

- Numerator: number of CAUTIs in each location monitored
  - Denominator: total number of urinary catheter-days for all patients that have an indwelling urinary catheter in each location monitored
  - Standardization factor: Multiply by 1,000 so that the measure is expressed as cases per 1,000 catheter-days
- b. Rate of bloodstream infections secondary to CAUTI: Use NHSN definitions for laboratory-confirmed bloodstream infection, available at <http://www.cdc.gov/nhsn/library.html>.
- Numerator: number of episodes of bloodstream infections secondary to CAUTI
  - Denominator: total number of urinary catheter-days for all patients that have an indwelling urinary catheter in each location monitored
  - Standardization factor: Multiply by 1,000 so that the measure is expressed as cases per 1,000 catheter-days
- B. External Reporting. Current NHSN definitions for CAUTI were developed for monitoring of rates within a facility; however, reporting of CAUTI rates for facility-to-facility comparison might be requested by state requirements and external quality initiatives.

#### OFFICERS AND MEMBERS OF HICPAC

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