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National Agenda for Prevention of Healthcare-Associated Infections in Dialysis Centers

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Abstract

Healthcare-associated infections (HAIs) are among the leading causes of morbidity and mortality in dialysis patients. To coordinate HAI prevention efforts, the U.S. Department of Health and Human Services established the National Action Plan to Prevent Healthcare Associated Infections in End-Stage Renal Disease Facilities. This comprehensive plan prioritizes HAI prevention practices and 5-year evaluation targets based on the burden of disease, level of scientific evidence, and anticipated impact from the recommended intervention. As such, the Plan focuses primarily on interventions to reduce vascular access-related complications and infections with hepatitis B and hepatitis C virus. Over the last decade, there have been several efforts to expand HAI surveillance and prevention efforts, including coordination of HAI reporting metrics across multiple national agencies, changes in financial incentives by the Centers for Medicare & Medicaid Services (CMS), and federal funding for expansion of state-based HAI prevention programs. As a result, a paradigm shift in HAI prevention has developed. Public health officials have assumed greater responsibility in reducing the burden of HAIs and healthcare providers have become more involved in HAI prevention. Since the Plan was initially drafted, several collaborative efforts in dialysis facilities have reported a reduction in HAIs through implementation of these interventions. These early successes highlight the potential impact of coordinated action to combat HAIs in dialysis settings and this National Action Plan provides evidence-based strategies on how best to achieve this.

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Background

Healthcare-associated infections (HAIs) are a significant cause of morbidity and mortality in the United States, with an estimated 1.7 million infections and 100,000 HAI-related deaths each year (1). Approximately $28 to $33 billion dollars of direct medical costs are attributed to HAIs annually (2). Infection is a leading cause of morbidity in dialysis settings as well. While the rate of all-cause hospitalizations in hemodialysis patients was unchanged from 1994 to 2010, the rate of hospitalizations for infection increased by 43% over the same time period (3). Use of a central venous catheter is a well-recognized risk factor for infectious complications in patients with end-stage renal disease (ESRD). There were approximately 37,000 central line-associated bloodstream infections (CLABSIs) in outpatient hemodialysis patients in 2008, comparable to the number of estimated CLABSIs in all inpatient settings combined during the following year (4). In addition, because of the frequent healthcare exposures and nature of the procedures used in hemodialysis, these patients are at increased risk for many other types of infections, including infections with bloodborne pathogens and multidrug-resistant organisms.

Given the preventability of HAIs and the potential for considerable healthcare cost savings, HAI prevention strategies have gained growing attention from national legislators and policy makers. In 2008, the Government Accountability Office (GAO) recommended that the Department of Health and Human Services (HHS) coordinate efforts to prioritize HAI prevention efforts across the Department (5). As a result, a committee of scientists, public health professionals, and program officials from multiple agencies, including the Centers for Disease Control and Prevention (CDC), the Centers for Medicare & Medicaid Services (CMS), and the Agency for Healthcare Research and Quality (AHRQ) was formed to develop a national strategy for HAI prevention. The plan, known as the National Action Plan to Prevent Healthcare Associated Infections (6), provides a roadmap for the prevention of HAIs. Now in its second phase, the Plan has a chapter devoted to promotion of infection control practices in ESRD facilities (7), with a particular focus on HAIs that are highly prevalent, preventable, and carry substantial risk for morbidity.

This review provides a summary of the National Action Plan to prevent HAIs in ESRD facilities and includes information about the 5-year national targets, the rationale for these goals, and evidence-based practice recommendations to achieve them. In addition, as the Action Plan helped to stimulate initial HAI prevention efforts in dialysis settings, early successes in some of these priority recommendation areas are also described. National priorities in HAI prevention are being increasingly linked to federal payment policies. Therefore, the details of the Action Plan should be of interest to healthcare providers not only because of the potential impact in the health of their patients, but also because of potential payment implications.

Overview of the HHS Action Plan

The HHS Action Plan is an interagency effort to prevent HAIs through implementation of evidence-based, economical, and operationally feasible interventions. Phase I of the Plan began in 2008 with a focus on prevention of infections in acute care hospitals, in particular

catheter-associated urinary tract infections (CAUTIs), central line-associated bloodstream infections (CLABSIs), *Clostridium difficile* infection (CDI), methicillin-resistant *Staphylococcus aureus* (MRSA), surgical-site infections (SSIs), and ventilator-associated pneumonia (VAP). Five-year national goals in these areas were described (Table 1) and a federal office charged with coordinating these activities was established. One major accomplishment of Phase 1 was the focus it provided for the nation on the prevention of HAIs through implementation of evidence-based practices, even when additional resources were not available. Recent data suggest that state and federal efforts can help drive a reduction in HAIs, as evidenced by the significant decrease in the rate of CLABSIs in US intensive care units (4). However, the substantial burden of HAIs in other areas, notably outpatient dialysis facilities, highlighted significant areas for improvement (4).

Phase II of the HHS action plan expanded prevention efforts to outpatient settings such as ambulatory surgical centers (ASCs) and ESRD facilities. As with Phase I, the goal of Phase II was to engage stakeholders to improve surveillance and promote the implementation of HAI prevention strategies. The recommendations outlined in the ESRD Action Plan were prioritized based on the burden and preventability of disease. As such, the chapter focuses primarily on vascular access-related complications and infections with hepatitis B and hepatitis C virus. Recommendations were primarily drawn from evidence-based guidelines; recommendations with higher quality evidence to support them were prioritized for inclusion. Because of a lack of infection prevention research trials conducted specifically in the hemodialysis patient population, these recommendations are also based on evidence from studies conducted among nondialysis patient populations (where the findings were translatable), observational studies, outbreak investigations, and expert opinion from several nationally recognized organizations, including CDC, the National Kidney Foundation Kidney Disease Out-comes Quality Initiative (NKF KDOQI), Kidney Disease: Improving Global Outcomes (KDIGO), Advisory Committee on Immunization Practices (ACIP), and the Association for the Advancement of Medical Instrumentation (AAMI).

National Action Plan in ESRD Facilities: Prevention Priority Recommendations

The Plan's priority recommendations (Table 2) have been categorized into the following:

1 *Prevention of intravascular infections*: As use of central venous catheters (CVCs) is highly associated with BSIs (8), these recommendations are largely centered on evidence-based practices to prevent intravascular infections in patients with CVCs. Such interventions include early placement and use of arteriovenous fistulas (AVF) or arteriovenous grafts (AVG), adherence to evidence-based practices for CVC insertion (e.g., use of maximal sterile barrier precautions and adequate skin antisepsis), and adherence to CVC maintenance practices (e.g., appropriate hand hygiene, catheter hub disinfection, and use of antimicrobial ointments at CVC exit sites). Recommendations to ensure adequate water and dialysate quality are also described.

2 *Prevention of bloodborne pathogen transmission*: A 2002 survey of US hemodialysis facilities reported that the prevalence of hepatitis B surface antigen (HBsAg) positivity and

antibodies to hepatitis C virus (anti-HCV) among patients tested was 1.0% and 7.8%, respectively (9). Given the burden of disease in this population and the potential risk of exposure to patients' blood during hemodialysis treatment if proper precautions are not followed, the Plan highlights specific recommendations to prevent transmission of these bloodborne pathogens. Such interventions include vaccination and hepatitis screening protocols for patients, isolation protocols for hemodialysis patients with active hepatitis B virus infection, safe injection practices, and proper practices for environmental cleaning and disinfection.

3 *Prevention of Influenza and Pneumococcal Disease*: Although influenza and pneumococcal disease transmission occurs in community settings as well, patients with chronic kidney disease are at increased risk for morbidity from these infections. Thus, the dialysis setting should serve as a primary point of prevention through immunization of all adult patients with pneumococcal vaccines and immunization of all patients and healthcare personnel with influenza vaccine annually.

4 *Prevention Priority Implementation Bundles*: To make the above interventions feasible for the busy clinical setting, they should ideally be implemented as "bundles" that can be easily incorporated into the daily work flow of healthcare personnel. This might include provider checklists (10), as has been successful with CVC insertion protocols (11), or other automated programs to facilitate implementation of prevention protocols, surveillance, and reporting.

5 *Education and Training*: To ensure that healthcare personnel are adequately trained to carry out the recommendations described, it is crucial that facilities establish protocols for training in basic infection control principles and a system to assess staff competencies in these areas. More work is needed to ensure that priority infection control topics are included as part of professional certification and recertification requirements (e.g., for dialysis technicians). Training should include patient and caretaker education, with a focus on patient-centered empowerment and involvement in infection control practices. CDC has begun to address this need with a recently released continuing education course (12). The one-hour, self-guided course provides online training for dialysis nurses and technicians on topics such as catheter care, medication handling, and hand hygiene. In the 4 months following the launch of the course, more than 3,000 clinicians completed the course and received continuing education credits.

Surveillance and Metrics

The HHS Action Plan proposes several metrics and 5-year evaluation targets to monitor progress in HAI prevention (Table 3). These include both process and outcome measures for the priority recommendations outlined in Table 2. As reduction in use of CVCs is a recognized goal of the Fistula First Program (www.fistulafirst.org) and other initiatives, the overall rate of CVC use is included as a process measure. Outcome measures for this category include incidence of positive blood cultures (with or without vascular access as a suspected source) stratified by type of dialysis access. Although the committee reported that data on incident BSI rates by CVC, AVG, or AVF were important for data collection and

analysis, a 5-year national target to reduce BSIs was only proposed for hemodialysis patients with CVCs, given the preventability of BSIs specifically in this group.

Additional process measures outlined in the Plan include the proportion of patients vaccinated against Hepatitis B and the proportion screened for new Hepatitis C infections biannually. As it is difficult to know whether incident infections of Hepatitis B and Hepatitis C can be attributed to healthcare exposures versus background rates in the community, outcome measures (e.g., reduction in new Hepatitis B infections) were not proposed as targets in the Plan. However, as healthcare exposures have been associated with Hepatitis B and Hepatitis C infections (13,14), adherence to the recommended infection prevention strategies can have an impact in reducing the burden of these infections in hemodialysis patients. Lastly, process measures for vaccination against influenza and pneumococcal disease have been proposed; however, given that these infections are not exclusively transmitted through healthcare exposures, outcome measure targets have not been proposed (Table 3).

Incentives

The Centers for Medicare & Medicaid Services have set minimal requirements, known as the conditions for coverage (CFC), for ESRD facilities to participate in the Medicare program (15). In the CFC category of patient safety, CDC-recommended infection control requirements are outlined in detail to help facilities strengthen their infection control procedures and adhere to best practices for HAI prevention. As the main payer for hemodialysis care in the United States is Medicare, most US hemodialysis facilities must comply with CFC standards to receive Medicare payments. Additional financial incentives were created pursuant to enactment of the Medicare Improvements for Patients and Providers Act of 2008 (MIPPA) (16), which authorized the ESRD quality incentive program (QIP). Under this program, ESRD facilities that fail to meet performance standards for specified measures will receive payment reductions of up to 2.0%. In the ESRD final rule published in November 2011, CMS included a measure for the payment year (PY) 2014 ESRD QIP requiring that providers enroll and report at least three consecutive months of dialysis event data to the National Healthcare Safety Network (NHSN), an internet-based HAI surveillance system managed by CDC (17). The ESRD final rule for calendar year (CY) 2013 and PY2015 expands this measure requiring providers report dialysis event data for a minimum of 6 months (18). As of November 2012, more than 5200 (94%) dialysis facilities have enrolled in NHSN.

Impact of Surveillance

Ongoing, systematic surveillance for HAIs is a critical component of HAI prevention. A better understanding of the epidemiology of infections occurring locally may help provide insight about facility-specific or regional problems that can help guide public health decision making. As an example of the value of surveillance, a busy hospital-based dialysis unit in the United Kingdom assessed the impact of implementing surveillance on bacteremia rates, antimicrobial starts, and admission to the hospital. Utilizing CDC's precursor to the NHSN dialysis event surveillance system, approximately 340 patient-months of data were collected.

Rates were shared with clinical dialysis staff and prompted unit-led programs to reduce risk and improve infection prevention practices. After 2 years of surveillance, the rates per 100 patient-months were significantly reduced for bacteremia (6.2 vs. 2.0), intravenous antimicrobial starts (7.7 vs. 4.1), and hospital admissions for access-related infection (4.0 vs. 1.4) (19). Although this study was unique in that the primary intervention was the implementation of surveillance, other studies have also demonstrated the beneficial impact of surveillance in detecting outbreaks or in preventing BSIs when implemented as a component of improved infection control practices (20,21).

The harmonization of metrics for HAI reporting across multiple national agencies was a major success of the National Action Plan. CMS has collaborated with CDC in promoting NHSN as the platform for HAI reporting for the Medicare Inpatient Prospective Payment Systems (IPPS) and ESRD QIP. CDC is also working with AHRQ in supporting the use of NHSN for CLABSI reporting in the AHRQ-funded “On the CUSP: Stop BSI” initiative and for dialysis event reporting in the AHRQ-funded National Opportunity to Improve Infection Control in ESRD (NOTICE) project. The systems in place for surveillance will be even more useful and effective when they can be integrated into healthcare providers’ daily work flow. As such, efforts are being made to facilitate simple, timely, and acceptable HAI reporting, utilizing electronic data from existing clinical databases in ESRD facilities. In September 2012, the NHSN system was updated to enable reporting to the dialysis event surveillance module via electronic import of clinical document architecture (CDA) files.

HAI Prevention—A Paradigm Shift

Historically, information about HAI surveillance and prevention strategies has been based on facility-level studies and the stakeholders in the field were primarily healthcare epidemiologists and infection preventionists. However, once data emerged on the preventability of HAIs (11,22), a growing audience became interested in the notion that adherence to certain infection prevention protocols could have a significant impact on reducing morbidity and mortality in patients exposed to the healthcare system. In the last decade, there have been several efforts to expand HAI surveillance and prevention efforts. The Deficit Reduction Act of 2005 (DRA) led to a change in CMS reimbursement policy that called for no increased payment for certain conditions (e.g., CAUTI, CLABSI, and certain SSIs) that were not present at the time of admission. The Omnibus Appropriations Act of 2009 raised awareness of the importance of HAI prevention on the federal level by requiring states to outline their own HAI prevention plans. In addition, the American Reinvestment and Recovery Act (ARRA) of 2009 designated $40 million for CDC to fund state HAI activities and $10 million for CMS to improve oversight and certification of ambulatory surgical centers (23).

This growing attention and legislative action has resulted in a paradigm shift in HAI prevention. Healthcare providers became more informed and invested in HAI prevention and the role of state health departments began to change. Public health officials assumed greater responsibility in reducing the burden of HAIs, recognizing the impact that infection prevention in healthcare settings can have on improving patient outcomes. As such, this work has been folded into core public health roles at the state level and local HAI expertise

has been expanded. Funding through ARRA, and now through the Affordable Care Act, has been distributed to help states develop infrastructure (including the hiring of a state HAI coordinator), monitor HAIs through NHSN, and prevent HAIs through multifacility prevention collaborative projects. Accordingly, states have made great strides in improving coordination of HAI efforts and in providing infection control training to front-line healthcare personnel.

Several collaborative projects to reduce HAIs in ESRD facilities have been established (see National Action Plan, Table 11) (7). There are several merits to this approach. Collaboration with other facilities within a group or geographic region facilitates exchange of information, helps identify common barriers, and provides an opportunity to share tools and ideas to overcome challenges. One particular collaborative is a good illustration of this approach. In 2009, CDC established the Dialysis BSI Prevention Collaborative in partnership with outpatient dialysis facilities. The collaborative consists of freestanding and hospital-based outpatient dialysis facilities around the country and aims to prevent BSIs in hemodialysis through surveillance and implementation of evidence-based practices (24). Several CDC recommendations are included as components of the collaborative program: surveillance and feedback of BSI rates using CDC's NHSN system, hand hygiene surveillance, vascular access care observations, patient and staff education, catheter reduction, chlorhexidine for skin antisepsis, catheter hub cleansing, and application of antimicrobial ointment or chlorhexidine-impregnated sponge dressing to exit sites (25). Data from 17 participating centers were analyzed, including up to twelve months of preintervention (January 2009 through December 2009) and 15 months of postintervention (January 2010 through March 2011) data. Decreases in pooled rates from the preintervention to postintervention period were reported for BSIs (1.09–0.89 per 100 patient-months, respectively) and access-related BSIs (0.73–0.42 per 100 patient-months, respectively). Modeled rates decreased 31% ($p = 0.015$) for BSIs and 53% ($p < 0.0001$) for access-related BSIs during intervention implementation (26).

The successes of these collaborative strategies have also been demonstrated at the individual facility level (27–29). As a participant of the CDC Prevention collaborative, a New Jersey hemodialysis center utilized the package of prevention interventions in addition to implementing a behavioral change intervention known as "positive deviance"— a process by which members of the collaborative identify and disseminate "deviant" or uncommon practices among them that have yielded better results (28,30). In this study, the incidence rate of access-related BSIs decreased from 2.04 to 0.24 per 100 patient-months after implementing both the program interventions and behavioral change intervention. Of note, only one access-related BSI occurred in the final 12 months of the postintervention period that included more than 1200 patient-months of data (28). There is early evidence that implementation of these evidence-based practices can yield positive results when effectively translated to facilities more broadly (31) and several audit tools and checklists can help translate CDC recommendations into practice (10).

Challenges

Although there has been great success to date in expanding surveillance and promoting HAI prevention, implementation of the recommendations out-lined in the National Action Plan can present new challenges. The expansion of HAI reporting necessitates that NHSN infrastructure be stable enough to support the continued growth in the number of reporting facilities. Adequate training of dialysis staff is necessary to ensure that case definitions are applied systematically and that there is minimal variability in HAI reporting. Over time, these definitions will need to be updated and refined in an ongoing, efficient, and standardized fashion. In addition, ensuring that the types of data collected are acceptable to those using the system will be important. As HAI reporting has already been tied to reimbursement, healthcare providers are increasingly questioning the reliability and clinical merit of some parts of these definitions, particularly as some have inherent subjectivity and need to be extensively validated before payment can be tied to performance. Moreover, when public reporting is tied to incentives, this can sometimes have the unintended consequence of focusing solely on one particular area at the expense of others. To avoid this, focusing on the HAI outcome measures themselves as well as addressing the root causes of these infections is important.

Resources at both the state and facility level may also need to be expanded. Although recent federal funding has helped improve state resources for HAI prevention, the current sustainability of these resources is unclear, while a further expansion of resources could accelerate prevention. In addition, it will be important to strengthen partnerships between outpatient dialysis providers and health departments, which traditionally have only established relationships with inpatient infection preventionists. This might be accomplished through the CMS-contracted quality improvement ESRD Networks (www.esrdnetworks.org). Several ESRD Networks and health departments have already collaborated around HAI prevention projects in ESRD, successfully leveraging health department experience with HAI surveillance and prevention, together with ESRD Network relationships with dialysis providers and expertise in quality improvement. At the facility level, the lack of dedicated infection control staff and training, in addition to dialysis care staff turnover, continues to serve as a barrier in implementing many of these interventions. Lastly, as hemodialysis patients are cared for by multiple providers in various healthcare settings, it is important that dialysis providers, inpatient providers, vascular surgery providers, and primary care providers coordinate efforts to ensure that HAI prevention issues are addressed as comprehensively as all other health maintenance issues; strategies to hold these other provider types accountable for prevention should also be explored. Consideration should be given to the fact that patients transition from multiple healthcare settings, including acute care, long-term care, and ambulatory healthcare settings. In addition to emphasizing the role of information technology in facility data feedback and collection, there is a need to highlight and develop data system interoperability solutions that allow for data to follow patients between care transitions. Data interoperability solutions would not only enhance bidirectional flow of information across the care continuum, but could serve to reduce the multiple reporting burdens facing providers today.

Because most of the early data on HAI prevention has come from inpatient settings, particularly ICUs, less has been known about effective dialysis-specific HAI prevention strategies. We are now beginning to see that increased adherence to CDC recommendations can successfully prevent HAIs in dialysis set- tings. Although these results are promising, a better understanding of the epidemiology of HAIs in dialysis settings is necessary. Little is known about the transmission of multidrug-resistant organisms between inpatient and outpatient settings and the emergence of antimicrobial resistance in this group of patients that is frequently hospitalized. In addition, while there is a great deal of evidence supporting optimal CVC insertion practices and increasing evidence to support preventability through improved CVC maintenance practices, further efforts are needed to explore policy changes that could decrease unnecessary CVC use (32). Additional gaps in knowledge include the role of environmental surfaces in transmission of pathogens in hemodialysis settings and the role of new devices, such as antimicrobial locks and novel catheter polymers, in BSI prevention. These areas are highlighted as important future areas of research in the National Action Plan for ESRD facilities.

Conclusion

There has been significant progress in HAI prevention in recent years, including in some dialysis settings. However, translating these successes to dialysis patients nationally is a work-in-progress. The recommendations outlined in the National Action Plan provide a roadmap on the best available, current evidence to combat HAIs and evidence supporting the practical effectiveness of these interventions is increasing. Because these interventions focus on diseases with high morbidity and mortality in the hemodialysis population, even modest improvements in HAI infrastructure and infection control practices will significantly impact the health of these patients.

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TABLE 1.

Five-year National Goals of the National Action Plan to Prevent Healthcare-Associated Infections, US Acute Care Hospitals, 2009–2013 (6)

Measure/metric	Source	National 5-year prevention target	Federal agency coordinator
Catheter-associated urinary tract infections	NHSN	25% reduction	CDC
Clostridium difficile infections	NHSN	30% reduction	CDC
Clostridium difficile hospitalizations	HCUP	30% reduction	AHRQ
Central line-associated bloodstream infections	NHSN	50% reduction	CDC
Adherence to central-line insertion practices	NHSN	100% adherence	CDC
MRSA invasive infections (population)	EIP	50% reduction	CDC
MRSA bacteremia (hospital)	NHSN	25% reduction	CDC
Surgical-site infections	NHSN	25% reduction	CDC
Surgical care improvement project (SCIP) measures	SCIP	95% adherence	CMS

AHRQ, Agency for Healthcare Research and Quality; CDC, Centers for Disease Control and Prevention; CMS, Centers for Medicare & Medicaid Services; EIP, Emerging Infections Program; HCUP, Healthcare Cost and Utilization Project; MRSA, methicillin-resistant Staphylococcus aureus; NHSN, National Healthcare Safety Network; SCIP, Surgical Care Improvement Project.

TABLE 2.

Priority recommendations of the national action plan to prevent healthcare-associated infections in end-stage renal disease facilities[7]

1. Prevention of intravascular infections

Selection of vascular access

- Use a fistula or graft instead of a CVC for permanent access for hemodialysis.

Recommendations for aseptic insertion of vascular catheters

- Maintain aseptic technique for the insertion and care of intravascular catheters
- Use maximal sterile barrier precautions including the use of a cap, mask, sterile gown, sterile gloves, and a sterile full body drape, for the insertion of CVCs or guidewire exchange.
- Prepare clean skin with a >0.5% chlorhexidine preparation with alcohol before CVC insertion and during dressing changes. If there is a contraindication to chlorhexidine, tincture of iodine, an iodophor, or 70% alcohol can be used as alternatives.

Recommendations for appropriate maintenance of vascular catheters

- Educate healthcare personnel regarding the indications for intravascular catheter use, proper procedures for the insertion and maintenance of intravascular catheters, and appropriate infection control measures to prevent intravascular catheter-related infections.
- Perform hand hygiene before and after palpating catheter insertion sites as well as before and after inserting, replacing, accessing, repairing, or dressing an intravascular catheter. Palpation of the insertion site should not be performed after the application of antiseptic, unless aseptic technique is maintained.
- Periodically assess knowledge of and adherence to guidelines for all personnel involved in the insertion and maintenance of intravascular catheters.
- Promptly remove any intravascular catheter that is no longer essential.
- Use polymyxin B/ bacitracin/ gramicidin (e.g., Polysporin® Triple) or povidone-iodine antiseptic ointment at the hemodialysis catheter exit site after catheter insertion and at the end of each dialysis session. Select an ointment that does not interact with the material of the hemodialysis catheter.
- Scrub the catheter access port with an appropriate antiseptic (chlorhexidine, povidone-iodine, or 70% alcohol) prior to accessing and access the port only with sterile devices.

Recommendations for water and dialysate quality

- Product water used to prepare dialysate or concentrates from powder at a dialysis facility, or to process dialyzers for reuse, should contain a total viable microbial count lower than 200 CFU/ml and an endotoxin concentration lower than 2 EU/ml.
- The action level for the total viable microbial count in the product water is 50 CFU/ml, and the action level for the endotoxin concentration is 1 EU/ml. If values above these action levels are observed in the product water, corrective measures should promptly be taken to reduce the levels.
- Conventional dialysate used to treat patients should contain a total viable microbial count lower than 200 CFU/ml and an endotoxin concentration lower than 2 EU/ml.
- The action level for the total viable microbial count of the dialysate bath is 50 CFU/ml, and the action level for the endotoxin concentration is 1 EU/ml. If values above these action levels are observed in the dialysate bath, corrective measures should promptly be taken to reduce the levels.
- Perform bacteriologic assays of water and dialysis fluids at least once a month and during outbreaks using standard quantitative methods.
- Disinfect water distribution systems in dialysis settings on a regular monthly schedule.
- Design and engineer water systems in dialysis settings to avoid incorporating joints, dead-end pipes, and unused branches and taps that can harbor bacteria.

2. Prevention of bloodborne pathogen transmission

Recommendations to prevent hepatitis B virus and hepatitis C virus infections

- Offer hepatitis B vaccine to all susceptible hemodialysis patients.
- Treat hemodialysis patients with active HBV infection at an isolation station with dedicated room, machine, supplies, and staff members.
- For patients who respond to the hepatitis B vaccine series, check surface antibody titers annually and administer a booster dose when indicated.
- Perform baseline hepatitis B serology (HBsAg, anti-HBs and total anti-HBc) of patients and repeat HBsAg monthly for susceptible patients to identify new HBV infections.
- Perform baseline HCV antibody screening of patients and repeat biannually for susceptible patients to identify new HCV infections.
- Offer hepatitis B vaccine to healthcare personnel to protect staff.
- Conduct bloodborne pathogen training for all staff with occupational exposure to blood or other potentially infectious materials upon initial assignment and yearly thereafter.

Recommendations for safe injection practices

- Do not administer medications from single-dose vials or bags to multiple patients or combine leftover contents for later use.
- Do not keep multidose vials in the immediate patient treatment area and store in accordance with the manufacturer's recommendations; discard if sterility is compromised or questionable.
- Use aseptic technique to avoid contamination of sterile injection equipment.

Recommendations for cleaning and disinfection

- After each patient treatment, clean and disinfect environmental surfaces at the dialysis station, including the external surfaces of the dialysis machine and prime waste containers.
- Thoroughly clean and disinfect environmental and medical equipment surfaces on a regular basis using EPA-registered disinfectants in accordance with manufacturer's instructions.
- Follow proper procedures for site decontamination of spills of blood or blood-containing body fluids, using an appropriate disinfectant.

3. Prevention of influenza and pneumococcal disease

Recommendations to prevent influenza and pneumococcal disease

- Offer influenza vaccine to hemodialysis patients on an annual basis.
- Offer influenza vaccine annually to healthcare personnel to protect staff, patients, and family members and to decrease staff absenteeism.
- Offer 1-dose of pneumococcal polysaccharide vaccine to adult dialysis patients and a one-time booster dose, for those vaccinated prior to age 65, after 5 years have elapsed.

TABLE 3.

Five-Year National Metrics and Evaluation Targets of the National Action Plan to Prevent Healthcare-Associated Infections in End-Stage Renal Disease Facilities[7]

Recommended Metrics	Definition (Calculation Formula)	Evaluation Target	Data Source(s)
All bloodstream infections stratified by vascular access type	1. No. of incident positive blood cultures in CVC patients/100 CVC patient-months	1. Pooled mean ≤ 5.0 OR RIR ≥ 40%	NHSN,[a] CrownWeb
	2. No. of incident positive blood cultures in AVF patients/100 AVF patient-months	2. N/A	
	3. No. of incident positive blood cultures in AVG patients/100 AVG patient-months	3. N/A	
Access-related BSI stratified by access type	1. No. of incident positive blood cultures with vascular access as suspected source or with unknown source in CVC patients/100 CVC patient-months	1. RIR ≥ 50%	NHSN,[a] CrownWeb
	2. No. of incident positive blood cultures with vascular access as suspected source or with unknown source in AVF patients/100 AVF patient-months	2. N/A	
	3. No. of incident positive blood cultures with vascular access as suspected source or with unknown source in AVG patients/100 AVG patient-months	3. N/A	
Seasonal influenza vaccination for ESRD patients	No. of ESRD patients who received seasonal influenza vaccination /all ESRD patients × 100	≥ 90%[b]	Medicare Claims data,[a] CrownWeb, KCQA
Facilities reporting to NHSN	No. of ESRD Facilities that report to NHSN/all ESRD Facilities x 100	≥ 90%	NHSN
Any CVC use in patients on hemodialysis	No. of hemodialysis patients with CVCs/No. of hemodialysis patients × 100	Absolute target: ≤ 20%; OR RIR ≥ 20%	Fistula First, NHSN,[a] CrownWeb
Screening for Hepatitis C antibody	No. of ESRD Facilities that screen all susceptible hemodialysis patients biannually/No. of all ESRD	≥ 70%	NHSN,[a] CrownWeb
Hepatitis B vaccine coverage in hemodialysis patients	Facilities × 100 No.of hemodialysis patients who have ever received > or = to 3 doses of hepatitis B vaccine/all hemodialysis patients x 100	≥ 90%[b]	Data from ESRD Networks,[a] CrownWeb, Medicare Claims

[a] As CrownWeb had not yet been launched at the time the Plan was written, it could not be confirmed as a definitive source of data.

[b] In line with Healthy People 2020 goals.

AVF, arteriovenous fistula; AVG, arteriovenous graft; BSI, bloodstream infection; CVC, central venous catheter; ESRD, end-stage renal disease; KCQA, Kidney Care Quality Alliance; NHSN, National Healthcare Safety Network; RIR, relative improvement rate.