**HHS Action Plan to Prevent Healthcare-Associated Infections:
PREVENTION – TARGETS AND METRICS**

I. Introduction

Ensuring safe healthcare in the United States is an essential part of realizing national goals
for a healthy population. The elimination of healthcare-associated infections (HAIs) is an
ambitious and challenging goal toward which the healthcare and public health communities
have been moving gradually over the past several years. Despite uncertainty about whether
there will ultimately be a limit to the extent to which this goal can be achieved, the decision
to move toward it has increasingly been embraced.

Although, this process is still imperfect, there continue to be improvements in technologic
and procedural capabilities for healthcare delivery and public health surveillance that are
gradually bringing us closer to realizing the goal of HAI elimination. The Department of
Health and Human Services' (HHS') effort toward this goal is a valuable and timely
opportunity to assess which national targets should be addressed first, and what actions
should be given the highest priorities in patient care at the bedside, and on the larger scale of
communities and health systems. The Action plan will coordinate where possible and
appropriate with existing departmental efforts, including Healthy People 2020.

The following section will discuss how the proposed national prevention targets were set and
how a number of metrics (seven in total) were identified. The metrics should help measure
the attainment of these targets to help prevent and control HAIs.

II. Background

In partnership with stakeholders from the medical, public health, and infection prevention
and control communities, the Department's Steering Committee for the Prevention of
HAIs (Steering Committee) and the Centers for Disease Control and Prevention (CDC)
convened a group of scientific experts in HAI prevention and public health in Arlington,
VA, on September 25, 2008 in order to provide input on the:

- Development of potential 5-year national prevention targets to be considered for
  the Action Plan to Prevent HAIs; and
- Identification of potential metrics and systems to assess progress towards these
  targets.

Participants included representatives from various federal agencies, the Healthcare
Infection Control Practices Advisory Committee (HICPAC), professional and scientific
organizations, researchers, and other stakeholders. The following is a summary of the
outcome of that meeting.

III. Identification of Metrics and 5-year National Prevention Targets

The group of experts was charged with identifying potential targets and metrics for six categories of healthcare-associated infections:

- Central Line-associated Bloodstream Infections (CLABSI)
- *Clostridium difficile* Infections (CDI)
- Catheter-associated Urinary Tract Infections (CAUTI)
- Methicillin-resistant *Staphylococcus aureus* (MRSA) Infections
- Surgical Site Infections (SSI)
- Ventilator-associated Pneumonia (VAP)

By the conclusion of the meeting, a total of 17 potential metrics and associated measurement systems and national 5-year prevention targets were identified. These metrics include both process and outcome measures and covered all six categories of healthcare-associated infections.

The finalized metrics and targets are shown in Table 1 below. (Note: The full list of considered metrics is available in Appendix A). Participants provided input and identified potential metrics using various criteria without attempting to reach consensus. At the meeting the participants divided into six focus groups, based on the six priorities identified earlier. Each of the six sub-groups developed the targets and metrics and brought them forward to the larger group for final discussion.

A sub-set of the HHS Steering Committee reviewed the list of proposed metrics from the meeting participants and identified those metrics that were supported by existing HHS measurement systems. In addition, recognizing the importance of working synergistically with partners, the finalized metrics complement and support existing national metrics and targets identified and/or adopted by key national stakeholder organizations, such as the National Quality Forum (NQF), and many are included in the Society for Healthcare Epidemiologists of America (SHEA)/Infectious Diseases Society of America (IDSA) *Compendium of Strategies to Prevent Healthcare-Associated Infections in Acute Care Hospitals*. (Note: The finalized metrics and targets with corresponding metrics from NQF and the SHEA/IDSA *Compendium of Strategies* are listed in Appendix B.) Having shared metrics promotes synergy and efficiency of all organizations working to reduce HAIs.

In the field of infection control and prevention there are a number of abbreviations used by the experts that are often found in the targets and metrics. These abbreviations are:

- ABCs: Active Bacterial Core surveillance
- ADT: Admissions Discharge Transfer
- CLIP: Central Line Insertion Practices
- EIP: Emerging Infections Program
- MDRO: Multidrug Resistant Organism
- NHSN: National Healthcare Safety Network
- SCIP: Surgical Care Improvement Project

Table 1 – Metrics and National 5-Year Prevention Targets

Metric Number and Label	Metric	Measurement System	National 5-Year Prevention Target
1. CLABSI 1	CLABSIs per 1000 device days by ICU and other locations	CDC NHSN; Administrative discharge data[1]	CLABSIs per 1,000 device days by ICU and other locations below present NHSN 25th percentile by location type (75% reduction in Stratified Infection Ratio)
2. CLABSI 4	Central line bundle compliance (non-emergent insertions)	NHSN CLIP module	100% compliance with central line bundle (non-emergent insertions)
3. C diff 1	Case rate per patient days; administrative/discharge data for ICD-9 CM coded Clostridium difficile Infections	Administrative discharge data; NHSN MDRO module	30% reduction in the case rate per patient days and administrative / discharge data for ICD-9-CM coded Clostridium difficile Infections NOTE: Preventability of endemic CDI is unknown; therefore, the meeting attendee experts suggested that HHS revisit this target in 2 years as prevention research findings may become available
4. CAUTI 2	# of symptomatic UTI / 1,000 urinary catheter days [Number of UTIs (ICD-9-CM +not present on admission) / (# major surgery ICD-9-CM + urinary catheter ICD-9CM)]*100 discharges	CDC NHSN Administrative discharge data[2]	25% reduction in the number of symptomatic UTI / 1,000 urinary catheter days 25% reduction in the [Number of UTIs (ICD-9-CM+not present on admission) / (# major surgery ICD-9-CM + urinary catheter ICD-9-CM)]*100 discharges[3]
5. MRSA 1	Incidence rate (number per 100,000 persons) of invasive MRSA infections	CDC EIP/ABCs	50% reduction in incidence rate of all healthcare-associated invasive MRSA infections
6. SSI 1	Deep incision and organ space infection rates using NHSN definitions (SCIP procedures)	CDC NHSN	Median deep incision and organ space infection rate for each procedure/risk group will be at or below the current NHSN 25th percentile
7. SSI 2	Adherence to SCIP/NQF infection process measures (perioperative antibiotics, hair removal, postoperative glucose control, normothermia)	CMS SCIP	95% adherence rates to each SCIP/NQF infection process measure

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[1] Any source that would provide nationally representative hospital discharge coding (i.e., ICD9 or, in the future, ICD10) data, including such sources as the Agency for Healthcare Research and Quality (AHRQ) Healthcare Cost and Utilization Project, the CDC National Center for Health Statistics or National Hospital Discharge Survey, and those in the Centers for Medicare and Medicaid Services (CMS).

[2] See above.

[3] Zhan C, et.al. Medical Care (in press)

IV. Central Line-associated Bloodstream Infections

Four national 5-year prevention targets and metrics were proposed for central-line associated bloodstream infections (CLABSI). To be consistent with the targets and metrics currently outlined and/or adopted by other national organizations, including the NQF and the SHEA/IDSA *Compendium of Strategies to Prevent Healthcare-Associated Infections in Acute Care Hospitals*, the selected targets and metrics listed in Table 1 include one outcome [Metric 1] and one process [Metric 2] metric:

1) [Metric1] CLABSI 1: CLABSIs per 1,000 device days by ICU and other locations. [Target1] CLABSIs per 1,000 device days by ICU and other locations below present NHSN 25th percentile by location type (75% reduction in Stratified Infection Ratio).

2) [Metric 2] CLABSI 4: Central line bundle compliance (non-emergent insertions). [Target 2] 100% compliance with central line bundle (non-emergent insertions).

Meeting participants discussed several challenges and considerations related to the use of the metrics identified.

- The group focused on ICUs with Metric 1, but proposed that other locations with other specific patient populations could also be used as the sample for the metric. The NHSN is a currently available data source that is designed and validated for this metric. Administrative data might be available as an additional electronic data source in the near future.

- In addition, some participants suggested that standardized algorithms to detect CLABSI be applied to exclude common skin contaminants and other organisms. Participants identified that Metric 2 is challenging because of a lack of an existing data stream. However, the NHSN CLIP module was launched in September 2008.

- Participants suggested several methods of reporting reductions in CLABSIs, including stratified infection ratios, a designated target rate, and a target that is based on performance percentiles within existing data.

- Meeting participants also identified several future needs for CLABSI metrics. These include the need for multiple sampling strategies; better methods to identify changes over time, including assessment, risk stratification, and rates for different risk groups; and a crosswalk gap-analysis across national data sources to understand variables in data sets and data validity.

V. *Clostridium difficile* Infections

One outcome metric [Metric 3] and 5-year prevention target for the reduction of *Clostridium difficile* infection (CDI) was identified after a review of possible metrics and targets.

1) [Metric 3] C diff 1: Case rate per patient days and administrative/discharge data for ICD-9-CM coded *Clostridium difficile* Infections. [Target 3] 30% reduction in the case rate per patient days and administrative / discharge data for ICD-9-CM coded CDIs. (Note: Preventability of endemic CDI is unknown; therefore, the experts suggested that HHS revisit this target in two years as prevention research findings may become available).

The identification of potential metrics was based on current science regarding the feasibility, validity, relevance, and availability of data. In addition to identifying metrics and targets for reduction of *Clostridium difficile* infections (CDI), meeting participants discussed other future needs and challenges summarized below.

- With respect to Metric 3, participants felt that administrative discharge data is potentially valuable for measuring CDI rates, particularly in that it is readily available, nationally representative, and could be used to establish a baseline. However, many also felt that in the future an additional system will be necessary. One possible system is the NHSN MDRO/CDI module.

- More broadly, participants noted that an urgent need exists to evaluate the preventability of CDI in endemic inpatient settings, preferably across a large number of hospitals and the role of patient care environment in transmission of *Clostridium difficile*.

- In addition, they discussed the need for enhanced capability in U.S. hospitals to measure and improve inpatient antibiotic use. One possible initial step is to conduct a survey of U.S. hospitals to identify whether or not an antibiotic stewardship team is in place and, if so, what is the team's purpose and functions at a given institution.

VI. Catheter-Associated Urinary Tract Infections

One specific outcome metric [Metric 4] and an associated target for the reduction of catheter-associated urinary tract infections was identified.

1) [Metric 4] CAUTI 2: # of symptomatic UTI / 1,000 urinary catheter days; [Number of UTIs (ICD9+not present on admission) / (# major surgery ICD9+ urinary catheter ICD9)]*100 discharges). This metric includes two possible measurement systems (NHSN or CMS). [Target 4] 25% reduction in the number of symptomatic UTI / 1,000 urinary catheter days; 25% reduction in the [Number of UTIs (ICD9+not present on admission) / (# major surgery ICD9+ urinary catheter ICD9)]*100 discharges.

Several challenges and needs related to the measurement of CAUTIs were identified.

- Participants suggested a comparison of NHSN symptomatic UTI (or available state data collecting similar variables) to administrative discharge data and a review of the UTI definition in non-acute care settings to validate data quality and ensure monitoring of the full burden of CAUTIs. Many experts pointed out current limitations of the UTI definition and proposed that the metric should focus only on bloodstream infections secondary to UTIs.

- In addition, participants suggested that strategies to widely implement "best practices" in the prevention of CAUTIs in a range of settings be developed. Participants felt that these actions would help identify targets and play a vital role in the selection of future metrics.

VII. Methicillin-resistant *Staphylococcus aureus*

One national 5-year prevention target and associated outcome metric [Metric 5] for the reduction of MRSA infections was proposed.

1) [Metric 5] MRSA 1: Incidence rate (number per 100,000 persons) of invasive MRSA infections. [Target]: 50% reduction in incidence rate of all healthcare-associated invasive MRSA infections.

Metric 5 is readily available and nationally representative data is available from an existing source. Future needs and challenges related to MRSA measurement are summarized below.

- Participants identified other potential metrics, including a metric measuring the incidence rate of hospital-onset bacteremia based on the NHSN MDRO module. However, the MDRO module is a new component of NHSN without available baseline data. As baseline data is developed and participation in the MDRO module grows, this metric may be considered in the future.

- Participants also felt that a "composite" target to improve sensitivity, reliability, and add confidence that the composite metric reflects reality should be considered in the future.

- The group noted that ongoing evaluation may be needed to determine whether shorter average hospital stays in some healthcare facilities might affect the sensitivity of current measurements of the metric.

- The experts recognized a need to move towards the use of electronic data sources (e.g., laboratory data).

- In addition, while administrative data may be valuable, concerns remain regarding the current administrative data systems' sensitivity and precision in capturing disease related to hospital care. CMS administrative data collected via ICD-9-CM codes have historically been designed and used for reimbursement, rather than public health monitoring, and data is not available for most populations under age 65.

- Other potential next steps identified by the expert participants include implementation of a standardized vocabulary for electronic data capturing of notifiable diseases, antimicrobial susceptibility and clinical data that is used for algorithmic detection of MRSA and other HAIs; evaluation of the need for risk adjustment methods of administrative data from healthcare facilities with patient populations at a disproportionate risk for HAIs; and while the target identified is important, long term efforts may benefit from a broader MDRO prevention effort that would ideally capture both MRSA and other HAIs not currently captured. The steps above were suggested as steps to help improve the quality of MRSA data and assist progress towards the 5-year MRSA prevention targets.

VIII. Surgical Site Infections

Two national 5-year prevention targets and metrics were proposed for surgical site infections (SSI), including one outcome [Metric 6] and one process [Metric 7] metric.

1) [Metric 6] SSI 1: Deep incision and organ space infection rates using NHSN definitions (SCIP procedures). [Target] Median deep incision and organ space infection rate for each procedure/risk group will be at or below the current NHSN 25th percentile.

2) [Metric 7] SSI 2: Adherence to SCIP/NQF infection process measures (perioperative antibiotics, hair removal, postoperative glucose control, and normothermia). [Target] 95% adherence rates to each SCIP/NQF infection process measure.

Metric 7 consists of five subcomponents which correspond to the SCIP/NQF measures:

1) Prophylactic antibiotic received within one our prior to surgical incision;
2) Selection of appropriate prophylactic antibiotic;
3) Prophylactic antibiotic discontinued within appropriate time frame after surgery;
4) Appropriate post-operative glucose control for surgical patients; and,
5) Appropriate hair removal and normothermia.

Numerous other possible metrics and targets were considered in the process of identifying the SSI targets. Participants felt that while the metrics selected may be the best currently available, a number of challenges remain to be implemented for use of these metrics at the national and local levels.

- Participants felt that the validity and feasibility of both metrics needs to be further evaluated, including a cost benefit analysis.

- Use of Metric 6 may require modifications in NHSN data collection, improved tools for collection of denominator data, and standardization of case finding. These improvements to the data collection will require staff and financial resources. Improvements to electronic data systems for surveillance (e.g., the ability to utilize inpatient pharmacy data for surgical site surveillance) should be incorporated into these systems to improve the efficiency and standardization of SSI case finding.

- Other needs identified by participants include harmonization of NQF and SCIP data in order to use the metrics proposed, development of a composite metric to capture performance across the entire spectrum of procedures and risk groups including pediatric SSIs, and re-evaluation of metrics and targets as additional evidence on preventability becomes available.

IX. Ventilator-Associated Pneumonia (VAP)

At this time, no valid outcome or process metric has been identified for VAP.

X. Other Considerations

During the process of identifying national 5-year prevention targets and metrics, a number of considerations, challenges, and next steps to make progress towards meeting the prevention targets were elucidated. These factors are important to consider as recommendations as the proposed targets are further refined and implemented as a part of the HHS effort:

- While it is recognized that the targets and metrics identified as a part of the HHS effort are to be national in nature, some scientific and professional experts commented that it is important that the national measures be linked to bedside actions.

- The refinement of national targets needs further consideration, taking into account existing baselines of data, known interventions, measurement systems to assess progress, and the amount of resources invested.

- There is concern over the potential use of aspirational targets as performance incentives without adequate development of the science base for prevention and feasibility, along with improved measurement systems and increased infrastructure.

- Challenges remain related to resource allocation and workforce development. As HAIs are reduced, the cost of detecting each event will become increasingly great. In addition, the implementation of interventions designed to move towards the target will require resources. While data for some metrics are already being collected, data for others will require additional information to be collected. These new methods of collecting and evaluating data will require staff and financial resources. It is important to limit the additional data collection burden on staff (as much as possible) and healthcare facilities to ensure that the focus of the professionals will be the implementation of prevention interventions that have an impact.

- It is important that existing national data sources identified for metric systems are validated. They need to avoid gaps in data for age groups and other population groups. The feasibility of use of various systems must also be carefully evaluated and used to inform research.

- Process measures data on HAIs is available from multiple sources, including administrative CMS, Quality Improvement Organization (QIO), and CDC data, in addition to data from state organizations and private sector activities. Opportunities exist to improve the use of and explore new uses for this data through linkage, learning, and data validation.

- "Cross-walking" will also be needed between data from systems with direct patient observations, laboratory data, and administrative data.

- Opportunities to move towards electronic data capture and reporting should be evaluated and sought out when possible. Investment in implementation of standards and vocabulary should be considered, along with the development of an enhanced surveillance infrastructure. Collections of data for process metrics often have the potential to be automated. Multiple opportunities to develop and evaluate automated process measures should be considered in the future.

- Development of improved performance measurement methods and systems for such cross-cutting infection control practices as compliance with hand hygiene and contact precautions is needed.

- National efforts to both measure and improve antimicrobial use are needed. These efforts should have a major impact on prevention efforts.

- Overarching targets that measure progress towards important practices and outcomes that indirectly impact HAI prevention should be developed, besides current targets that are fairly disease specific or type-infection specific. Organizational measures, such as nurse/patient ratio, should be explored and considered in developing overarching targets.

- There is a need to leverage and synergize efforts by government agencies, the NQF, the Joint Commission and other accreditation groups, state agencies, and other stakeholders to make an impact on HAI prevention. The identification of metrics and targets is the starting point of a broad effort that relies on the efforts of numerous federal agencies and organizations to reduce HAIs and meet the 5-year prevention targets. These metrics and targets will assist in measuring the impact of these efforts throughout the next five years.

XI. Conclusion and Possible Next Steps

The group also began a discussion as to how the HHS Action Plan could be implemented to achieve the targets. Some key strategies or recommendations for reaching these goals include creating system-improvement programs and extending and improving distribution channels (e.g., states, professional societies, QIOs, health systems). These actions coupled with specific actions related to the metrics and targets would dramatically help prevent HAIs in the United States and reduce both morbidity and mortality.