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Evaluating National Healthcare Safety Network Surveillance of

Healthcare-associated Infection Events in Home Health Care

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Abstract

Evaluating National Healthcare Safety Network Surveillance of Healthcare-associated Infection Events in Home Health Care

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An increase in the use of home health care (HHC) as an alternative to the traditional healthcare setting is spurred by innovative technologies that allow for improved quality of care at home and a need to cut costs. Although the home setting separates patients from many of the risks of infection exposure as compared to a facility-based setting, it is also uncontrolled and has a host of factors that have posed barriers to effective infection prevention and surveillance. As HHC becomes more commonplace, healthcare-associated infection (HAI) surveillance systems will also need to track and monitor infection prevalence and the impact of intervention efforts in this growing healthcare setting. With approximately 5 million people receiving health care at home, there is a need to gain a more complete picture of the true burden of HAI affecting patients.

The purpose of this thesis project was to confirm the hypothesis that National Healthcare Safety Network (NHSN) surveillance does not include HAI data from the HHC setting and determine if the literature describes possible data sources to create a more complete picture of HAI burden. To achieve the goals of this thesis, a program evaluation and literature review were conducted.

The program evaluation and literature review confirm that HAI data from the HHC setting is not currently reported to the NHSN or used in HAI surveillance reporting. The literature called for the need for national or nationally-coordinated surveillance efforts, but none currently exist. The variability in how home health agencies define and identify infections makes it difficult to estimate the incidence and prevalence of HAI across HHC sites and establishing a baseline by site of infection is currently not possible.

Investigators have pointed to Medicare Outcome and Assessment Information Set (OASIS) data as a possible data source with a validated data collection process to integrate HAI reporting from home healthcare agencies. Reviewing specific data elements of the OASIS data set, there does appear to be a viable option to enhance HAI surveillance with data on infection events attributable to the HHC setting.

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Chapter 1: Introduction

Morbidity and mortality associated with unintentional exposure to bacteria and viruses in healthcare settings is a public health problem in the United States. Known as healthcare-associated infections (HAIs), these infections are defined as *"infections that develop in a patient who is cared for in any setting in which healthcare is delivered (e.g., acute care hospital, chronic care facility, ambulatory clinic, dialysis center, surgicenter, home) and is related to receiving health care (i.e., was not incubating or present at the time healthcare was provided)"* (1). These infections range from those resulting from the use of central lines, indwelling catheters, and respiratory ventilators, to exposure to healthcare professionals and others who are not appropriately vaccinated or who do not follow proper hand-hygiene procedures. A recent study in the New England Journal of Medicine estimated that the burden of HAI was 721,800 infections affecting approximately 648,000 patients in acute care hospital setting in 2011(2). To provide context of the scale of this burden, there were approximately 36 million admissions to acute care hospitals based on the American Hospital Association's 2012 Annual Survey data (3). Magill, et al. assessed the burden of HAI in the acute hospital setting, but there are other settings where patients receive health care such as outpatient clinics, long-term care facilities, and the home.

Home health care (HHC) stays are becoming more commonplace and is a growing sector in the healthcare industry. In 2012, the HHC market was $77.8 billion and is projected to grow to $157 billion by 2022 (4). The use of the home as an alternative to traditional healthcare settings is spurred by innovative technologies that allow for improved quality of care at home and a need to cut healthcare costs. Home health care stays are more

comfortable and safer, too. Patients are less likely to be mistaken for someone else and there is limited exposure to the resistant organisms of other patients.

The increasing trend in HHC stays is also riding the wave of the aging U.S. population. The HHC setting is used mostly by adults over the age of 65 years (5). By the year 2050, the older population of adults is projected to reach 88.5 million people with 17.9 million of those over age 85 (6). Using the 2013 national average rate of 91.12 per 1000 people age over 65 using home healthcare services, approximately 8 million people may be receiving health care at home by 2050. Today, nearly 5 million people receive health care at home; a majority of them paying for their care through Medicare (5).

Although the home setting geographically separates patients from many of the risks of infection exposure as compared to a facility-based setting, there are other factors that make infection control and prevention challenging (7). The home setting is uncontrolled, there is variability in the level and quality self-care and from relative caregivers, there is evidence of a lack of continuity of care and communication between sites and clinicians, and there is limited capacity to collect numerator and denominator data to calculate a baseline for infection surveillance and control (8). It is difficult to measure the magnitude of HAI in the HHC setting because there are inconsistencies in the definitions used to classify infections among home healthcare agencies and few published studies have looked across more than one agency and more than one infection type (9).

A 2014 systematic review of the incidence and prevalence of infection in the HHC setting revealed that there is a need for more surveillance, coordination and communication to ensure patient safety and long-term recovery (9). The investigators found infection definitions, rates, and risk factors varied dramatically across studies and were limited by

sample size and methodological quality. Shang, et al. called for the need to implement a surveillance system for HHC infections which would allow for confirmation of the risk factors for healthcare-associated infections in the home setting.

The National Healthcare Safety Network (NHSN) is a nationally-focused HAI surveillance system implemented by the Centers for Disease Control and Prevention (CDC). CDC states that NHSN is the *"nation's most widely used HAI tracking system"*(10). The most recent HAI annual progress report featuring data from 2014, summarizes progress towards HAI prevention goals for five HAI types, (i.e., central line-associated bloodstream infections, catheter-associated urinary tract infections, surgical site infections, hospital-onset *Clostridium difficile* infections, hospital-onset methicillin-resistant *Staphylococcus aureus* bacteremia) (11). Data is reported to NHSN from over 17,000 facilities representing acute care hospitals, long-term acute care hospitals, and inpatient rehabilitation facilities (11).

Based on review of NHSN annual progress reports, it did not appear that the home setting was represented in NHSN HAI surveillance efforts. The purpose of this thesis project was to confirm that NHSN surveillance does not include HAI data from the HHC setting and determine if the literature describes possible data sources to create a more complete picture of HAI burden. There were five aims to this project:

- Describe how NHSN tracks HAI acquired in the home healthcare setting
- Describe the known scope and magnitude of HAI among patients receiving care at home
- Discuss the distinctive features of HAI data collection in HHC setting

- Develop a context diagram showing how HHC HAI data sources could be incorporated into NHSN
- Discuss whether or not data collection of HAI events in the home healthcare delivery setting should be pursued by stakeholders

As HHC becomes more commonplace, HAI surveillance systems will also need to track and monitor infection prevalence and the impact of intervention efforts in this growing healthcare setting. With approximately 5 million people receiving health care at home, there is a need to gain a more complete picture of the true burden of HAI affecting patients.

Chapter 2: Methodology

This thesis project evaluated surveillance data collected and reported by the NHSN. Initially the project approach included several different data sources including NHSN progress reports, informational conversations with NHSN and home health care stakeholders serving in their professional roles, and direct review of surveillance data. After Institutional Review Board human subjects' determination pre-assessment, the thesis project was modified to focus only on publicly available publications and reports, to limit informational discussions to NHSN professionals only, and to eliminate review of surveillance data due to possible patient privacy concerns. The modified approach more appropriately reflected the scope and intent of the aims of this thesis project. This thesis project, after modification of the approach, was deemed to be exempt from IRB review.

There were two main phases to this thesis project. The first phase focused on confirming or rejecting the hypothesis that NHSN does not include HAI data from the HHC setting. The second phase focused on understanding the current landscape and what the literature contained regarding HAI surveillance in the HHC setting.

Phase 1:

The approach used in the first phase (confirm/reject hypothesis) consisted of conducting a program evaluation of NHSN. Process documentation, data models, context diagrams, and surveillance reports generated by NHSN were reviewed and assessed for inclusion of HAI data from the HHC setting. The exploration also identified who reports data to NHSN and how NHSN standardizes HAI definitions and the reporting process. Information was gathered and analyzed from the NHSN website

(https://www.cdc.gov/nhsn/index.html) and via informational discussions with an NHSN staff member to get clarification on location-specific data elements.

Phase 2:

The approach used in the second phase consisted of a literature search. Table 1 shows the search terms used to scan the literature for any studies and other resources that discussed the surveillance or control of HAI in the HHC setting. Federal government reports and informational resources, academic and online journals, and home health industry and affiliated groups' publications were reviewed. The literature search was conducted via the Emory Woodruff Library resources of the Medical Literature Analysis and Retrieval System Online (MEDLINE via PubMed) and Cumulative Index of Nursing and Allied Health Literature (CINAHL) databases, and through Internet search via Google Scholar.

Table 1: Search Terms Used for Database and Internet Searches

Search Terms used for MEDLINE (via PubMed) CINAHL databases	**Total # of Articles**	**Relevant Articles Reviewed**	**Articles Used for Thesis**
(Surveillance).mp and (home).mp and (health* or healthcare*).mp	11	0	N/A
(Surveillance).mp and (infection).mp and (health* or healthcare*).mp	89	0	N/A
"home health care"[All Fields] AND ("infection"[MeSH Terms] OR "infection"[All Fields]) AND ("epidemiology"[Subheading] OR "epidemiology"[All Fields] OR "surveillance"[All Fields] OR "epidemiology"[MeSH Terms] OR "surveillance"[All Fields]) AND ("2000/01/01"[PubDate] : "2016/12/31"[PubDate])	256	37	9
Search Terms used for Google Scholar search	**Total # of Articles**	**Relevant Articles Reviewed**	**Articles Used for Thesis**
"Home health care" + "surveillance system" + "national" + "infection"	814	300	3
"Home health care" and "HAI"	486	260	8
Total Articles Kept from Literature Review			**20**

The literature review was limited to only English language sources with a focus on U.S. HHC sites from the year 2000 and later. The year 2000 was selected because the first draft of nationally-applicable HAI surveillance definitions for HHC were published that year (12). Prior to the year 2000, there were no recommended definitions at the national level. Sources primarily discussing HAI surveillance outside of the United States, risks and hazards to home health care staff, and home care (not home health care), nursing homes, or assisted living facilities were outside the scope of the literature review.

Chapter 3: Findings

Findings for Phase 1: Confirm/Reject Hypothesis

The NHSN website[1] offers very specific and detailed information on conducting HAI surveillance in different types of inpatient and outpatient facility settings. The resources available on the website include enrollment information for new facilities, surveillance and infection definitions, surveillance and infection control guidelines, trainings, protocols, and other tools to support enrolled facilities in collecting and reporting HAI data. None of the resources as of the writing of this thesis include information on the home healthcare setting.

Identifying HAI in any healthcare setting relies on the application of an identification process which determines the first day of an infection and where a patient's infection is attributable. Defining a specific set of terms used in HAI surveillance is useful here for the reader to understand the context of HHC data in HAI surveillance efforts.

One of the most important data points to determine in HAI surveillance is the Date of Event. Date of Event is *"the first day that an NHSN infection criterion element is present for the first time"* (13). The infection criterion is a localized sign or symptom that indicates there is an infection, usually recognized by a healthcare provider. The Date of Event then allows for the calculation of the 7-Day Infection Window Period. From the Date of Event, the 7-Day Infection Window Period establishes the 3-day before and 3-day after window. Mapping the day of admission onto the 7-Day Infection Window Period helps determine whether the infection can be classified as a HAI. *"An infection is*

[1] https://www.cdc.gov/nhsn/index.html

classified a HAI if the Date of Event of the site-specific infection occurs on or after the 3rd day of admission where day of admission is day 1" (13).

Reporting HAI surveillance is also contingent on specifying the healthcare setting where infection is attributable. To do this, NHSN provides guidelines in a document called "CDC Locations and Descriptions and Instructions for Mapping Patient Care Locations" (14). This document includes information on how to code the different care delivery locations in a standardized way. The coding supports the attribution of HAI to the correct location or facility area for the purpose of comparison, baseline calculation, and to monitor the effects of interventions. In this manual, there are four location codes that could be used to attribute infection in the home healthcare setting. An excerpt from the document is available in Table 2.

Table 2: Location Codes Relevant to Home Healthcare Setting (Excerpt)

CDC Location Label	NHSN Location Code	CDC Location Code	Description
Home Hemodialysis	1262-1	COMM:NONACUTE:HOME:DIAL	Hemodialysis performed by patient at home
Home Care	1192-4	COMM:NONACUTE:HOME	A patient's home location where medical services including routine noninvasive and other noninvasive procedures (e.g., insertion of indwelling urinary catheter, insertion of IV line) are performed by healthcare workers and family members under the supervision of a licensed independent practitioner (e.g., MD, CNP, PA).
Home-based Hospice	1194-0	COMM:NONACUTE:HOME:HSP	A patient's home location where end-of-life services are performed by healthcare workers, family members, and volunteers.

Location outside facility	1204-7	COMM:NOTFAC	A location outside of the facility including unknown outside location

The excerpt above indicates four different location codes that could be used for infections in the home setting, however, a review of all published annual NHSN HAI surveillance reports (2004 to 2016) do not include any data or information attributing HAI to HHC stays (15). Questions directed to an NHSN staff person revealed that the location codes are used to attribute community-based infections acquired at home that are present on arrival of the patient to the facility (16). The home-based location codes are not currently used to report HAI attributable to the home setting.

Based on the review of the surveillance resources and annual reports, and the direct questions asked of NHSN staff, it is confirmed that HAI data from the HHC setting is not currently reported to the NHSN or used in HAI surveillance reporting.

Findings for Phase 2: Literature Scan

In summary, the literature scan yielded 20 sources that discussed HAI surveillance and infection control specific to the HHC setting. These sources characterized the need for increased surveillance conducted by individual home healthcare agencies and at the national level, but provided only a few examples of how HHC infection surveillance is currently being implemented in these ways. The sources lacked consistency in infection definitions. Some called for the expansion of data sources for more complete monitoring and tracking of HAI to include data from the home healthcare setting. These are described in more detail below.

Scope of Home Health Care

The federal Centers for Medicare and Medicaid Services (CMS) certifies home health agencies (HHAs) to provide skilled nursing care to patients. According to CMS, skilled nursing includes the following services (17):

- Wound care for pressure sores or a surgical wound
- Patient and caregiver education
- Intravenous or nutrition therapy
- Injections
- Monitoring serious illness and unstable health status

A 2012 National Health Statistic Report summarized the characteristics of home health care use by patients age 65 and over from 2007 data. It found that 85% of HHC services were for skilled nursing services for eight common chronic conditions such as hypertension, heart disease, diabetes mellitus, chronic obstructive pulmonary disease, osteoarthritis, dementia, malignant neoplasm, and cerebrovascular disease (18).

HAI Surveillance Definitions

There are two documents specific to the HAI surveillance in the HHC setting. One is the "Draft Definitions for Surveillance of Infections in Home Health Care" published in 2001 (12). The other is the "APIC-HICPAC Surveillance Definitions for Home Health Care and Home Hospice Infections" published in 2008 (1). The most recent surveillance definition document outline how to identify HAI in the home setting. There are some differences to facility-based HAI surveillance and home-based HAI surveillance based on these definitions. First, the infections identified as HAI in the HHC setting are temporal and not causal. There are many factors that cannot be controlled when care is provided in

the patient's own home, it is difficult to ascertain the geographic location of the infection. The definition of HAI in the HHC "are those infections that were neither present nor incubating at the time of initiation of care in the patient's place of residence" (1).

Prevalence of Infections in HHC Setting

Part of the Medicare certification requirement for HHAs is regular quality measure reporting via the Outcome and Assessment Information Set (OASIS). These data are used to assess the health status of patients during their HHC stay and can be useful to HHAs for outcomes-based quality improvement activities and interventions (19). One study conducted a retrospective study of 199,462 home health care patients using national OASIS data and found that approximately 17% of patients had unplanned hospitalizations during their HHC stay (20). Of those, a little over 6,000 patients were hospitalized due to infections. This study demonstrated the prevalence of infections in the HHC setting and explored the possibility that OASIS data could be a useful data source to support national HHC HAI surveillance efforts.

Using OASIS Data for HAI Surveillance

Another source also pointed to the use of OASIS survey data to complement HAI surveillance with information from the HHC setting (21). Yeung described the need for more concreteness in surveillance definitions to eliminate the kind of ambiguity that would negatively influence the quality of HAI surveillance in HHC. Yeung suggested that data for HAI surveillance could include OASIS survey data in addition to clinician reporting, case conferences, local hospital data, and networking with local infection preventionists. Yeung highlighted several of the survey questions based on their usefulness to flag possible HAI such as those that asked whether patients used emergent

care, reasons for unplanned hospitalization during the HHC stay, and treatment for UTI in the last 14 days.

OASIS data are collected at several different points of time by a registered clinicians as indicated below:

- Start of care (SOC),
- Resumption of care following inpatient facility stay (ROC)
- Recertification within the last five days of each 60-day recertification period (note: patients are given a 60-day payment episode and must be recertified for care every 60 days by a physician)
- Other follow-up during the home health episode of care
- Transfer to inpatient facility
- Discharge from home care
- Death at home

Yeung identified a particular set of questions in the OASIS instrument called potentially avoidable events (PAEs) that could serve as *"markers for potential problems in care because of their negative nature and relatively low frequency"* (22). There are three subject area groups covered in the PAEs: Needed to Use Emergency Room, Development of New or Worsened Problem, and Discharged with Unresolved Problem. Each of these subject area groups include four measures each that further specify the reason for the PAE. Two of them are relevant to HAI surveillance: *needing to use the emergency room because a wound got worse or infected* and *developed a bladder infection*. The specific data elements that can be useful to HAI surveillance in HHC are listed below. These data

elements are part of the most recent update to the OASIS instrument called OASIS-C2 which will go into effect January 1, 2017. These data elements are similar to, and have the same item set identifier, as the OASIS-C1 that is currently in effect until December 31, 2016.

M2301 is the item set that describes emergent care. The question states: "At the time of or at any time since the most recent SOC/ROC[2] assessment has the patient utilized a hospital emergency department (includes holding/observation status)" (23). There are four possible responses: no, yes with hospitalization, yes without hospitalization, and unknown. If the response is classified as a 'Yes', the respondent must indicate all reasons for emergent care in M2310. The following list describes the choices that could indicate a possible HAI:

3 – Respiratory Infection

4 – Other Respiratory Problem

13 – Urinary Tract Infection

14 – Intravenous-catheter related infection or complication

15 – Wound infection or deterioration

Selection of any of the above selected reasons for emergent care, the HHA could calculate the Date of Event and the 7-day Infection Window Period to determine whether the infection could be associated with the HHC stay.

[2] SOC = Start of Care, ROC=Resumption of Care

Item M1600 is another item that could be used to trigger further investigation into whether an infection might be associated with the HHC stay. M1600 is the item set that describes elimination status specific to urinary tract infections (UTIs). The question states: “Has this patient been treated for a Urinary Tract Infection in the past 14 days?” This item is required for inpatient facility transfer and when care ends. There are four possible responses: no, yes, not applicable (patient is on prophylactic treatment), and unknown. An approximate Date of Event and 7-day Infection Window Period could be determined for those patients whose M1600 response is coded as a ‘yes’ and possibly even ‘NA’.

Using item set M2301 (Emergent Care) above, it is plausible to retrospectively determine a possible HAI from the HHC setting if the patient’s HHC stay began more than three days before needing emergent care. It may also be plausible to approximate the 7-day Infection Window Period from item M1600 (UTI Treatment) even though the timing of data collection would pose challenges. This data element is usually collected when the patient is being discharged from HHC or transferred into an inpatient setting. If at the time of discharge, the response to M2301 is ‘yes’ or ‘NA’, and the patient’s HHC stay is longer than four days, then the infection may be associated with the HHC stay.

This literature review found no sources discussing national HHC HAI surveillance efforts aside from the establishment of national surveillance definitions in 2008, though several call for the need for national or nationally-coordinated surveillance efforts (1, 9, 20, 21, 24). Many articles confirmed that agencies use their own definitions to calculate baseline infection rates in the HHC setting (7-9, 20, 21, 25-30) . This variability makes it difficult

to estimate the incidence and prevalence of HAI across HHC settings and establishing baseline by site of infection is currently not possible.

While there exists surveillance definitions for HAI in HHC settings, infection data are not making it to NHSN. As mentioned above, there have been no published NHSN surveillance reports to-date that include information on HAI surveillance in home health care (15). It appears that the elements needed for surveillance exist such as validated surveillance definitions for the HHC setting and an existing information system capable of receiving data from HHAs. What does not exist is an effort to engage and encourage HHAs to report data or any indication that HHAs have the capacity to report HAI surveillance data to any centralized system. The findings of this thesis project confirm that there is no surveillance of HAI in the HHC setting, but perhaps even more significant is the lack of understanding of the burden of morbidity and mortality caused by infections in general in the home health care setting.

Chapter 4: Discussion

The aims of this thesis were to confirm or reject the hypothesis that HAI surveillance via NHSN does not include infection data from the HHC setting and to scan the literature for discussion on HAI surveillance in the HHC setting. The investigation and literature review confirm that NHSN currently does not include data on HAI events attributable to the HHC setting, however, surveillance definitions for home health care infections exist. Recent studies and a systematic literature review also reinforce the gap in HAI surveillance data from the HHC setting and the need to fill this data gap to have a true understanding of the burden of HAI in the population.

Limitations

There were few limitations to the implementation of this thesis project. The initial approach of the project was changed to protect patient privacy, however, the lack of access to actual surveillance report data did not limit the ability to achieve the overall aims of this project.

Recommendations and Next Steps

The data reporting pathway represented by the OASIS survey data described above could help launch the reporting and use of infection-related information from HHAs for HAI surveillance. In its current state, OASIS data does not adequately meet the quantitative requirements for identifying and classifying HAI. HAI surveillance is dependent on the ability to identify when and where the infection actually took place. Determining the 7-day Infection Window Period requires the ability to pinpoint the Date of Event, or the first day that the signs or symptoms of the infection occurred (13). The whereabouts of the patient in the 3-day period before the Date of Event is critical to accurately attributing

HAI to the correct location. The reporting triggers for OASIS data do allow for accurate calculation of the Date of Event.

What would it take to use OASIS data to fill the data gap from the HHC setting? At first glance it might appear to be “low-hanging fruit” to use OASIS data to approximate the 7-day Infection Window Period for urinary tract infections and infections causing hospital admissions. NHSN is already exchanging quality measurement data with CMS so there is an information sharing relationship that could be expanded further. Sharing OASIS data could be made possible through an interagency agreement or other similar mechanism. Similar to the process used by healthcare facilities to report data to NHSN, CMS could report the data it receives from its certified HHAs directly to NHSN. With the right collaboration between CDC and CMS, and executed data use agreements, data reporting between CMS and NHSN may be possible.

A future study could pilot how OASIS data described above can be packaged, reported to NHSN, and analyzed. The addition of the new data set does not drastically change the current data context diagram. Figure 1 shows the current- and future-state context diagram for NHSN in this scenario. The dotted purple line shows the change that would need to be made to integrate OASIS data into NHSN surveillance.

An additional possibility is for CDC to collaborate with CMS to improve the readiness and capacity of HHAs to themselves report HAI surveillance data to NHSN. There is a cost-savings benefit to CMS if infections are prevented and a benefit to public health

when infection events are baselined and tracked for vulnerable populations

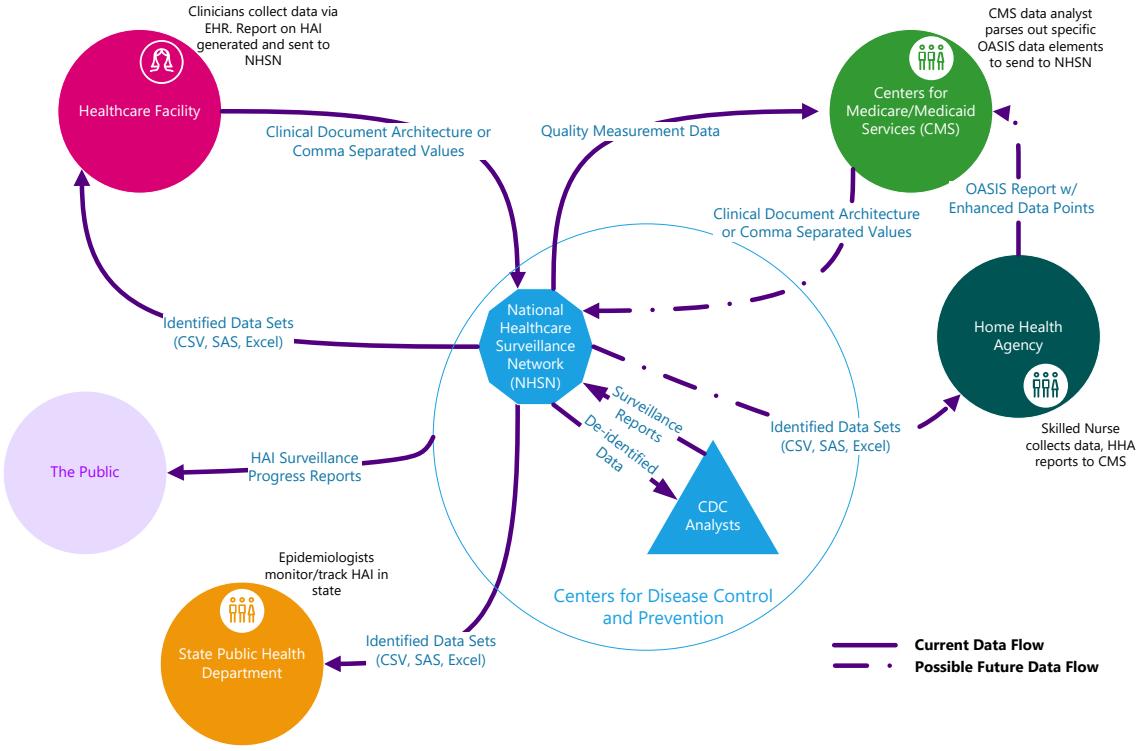

Figure 1: NHSN Current- and Future-State Context Diagram. Current-State from NHSN Innovation: Creation of Synthetic Data for Ventilator-Associated Events Presentation, Barry Rhodes, 2014

like those who may use alternative healthcare settings like the home. The literature search conducted in Phase 2 of this thesis project found very little published evidence that HHAs are conducting their own infection surveillance efforts. An effort to mobilize and standardize HAI surveillance among HHAs could also be a first step to more complete nationwide HAI surveillance.

Surveillance definitions for HAI surveillance for HHC clearly articulate the factors that make HAI surveillance slightly different in the home setting. The literature also describes how the influence of the environment, family member caretakers, and self-care by the

patient can make it difficult to determine whether an infection was caused through the delivery of care by a skilled nurse or by someone or something else. The uncontrolled nature of a healthcare setting should not limit the collection of data that could be helpful in preventing HAI. CDC analysts working with de-identified NHSN data could clearly articulate the limitations of the data collection in annual reports. The best-available yet imperfect data may be useful enough to identify unusual patterns and guide intervention efforts, especially to improve the quality of care and outcomes for some of the most vulnerable patients. Future studies could investigate whether it is possible to collect enough data to show the impact that interventions like handwashing and vaccination campaigns aimed at HHAs and education/training of HHC patient caregivers have on preventing infections in the HHC setting. It is my opinion that there is still merit in conducting HAI surveillance in the HHC setting even with limited control.

To do this, HHAs would need to be engaged and invited to report data to NHSN. Similar tactics used to recruit facility-based providers can be used to recruit HHAs. To limit the burden on HHAs, it may be possible to work with CMS to modify the OASIS assessment in future iterations to be more usable for HAI surveillance. CDC could also provide resources for HHAs on the NHSN website. At this time, there are no other resources available for HHAs aside from the updated and finalized surveillance definitions.

Conclusion

The overall aim of this thesis project were to confirm that infection data from HHC are not part of the surveillance conducted by NHSN. They are not. I also wanted to explore what the existing literature includes when it comes to HAI surveillance in the HHC setting, especially for surveillance efforts at the national level. I determined that there are

few voices calling for national-level surveillance of HAI in the HHC setting, but those voices are clear, specific, and are contributing to an evidence-base justifying the need for more complete HAI surveillance. This project has highlighted the possibility that Medicare OASIS data could be a useful data source for filling the HAI surveillance data gap.

Clearly, there are viable options to enhance national-level HAI surveillance with HHC data. There are valid concerns about the ability to control a home environment to adequately identify and prevent HAI events. However, the public health community has developed surveillance definitions that account for the factors that limit infection control in the home. Future studies and efforts should explore whether OASIS data is appropriate for HAI surveillance and a pilot investigation could be undertaken using OASIS data for HAI surveillance. Additionally, there are opportunities to develop and disseminate resources to support the standardization of infection identification and control efforts among Medicare-certified HHAs.

It is a fact that the population in the United States is aging. Alternative healthcare delivery models are using the patient's home for the types of care and recovery that were traditionally done in a clinical facility. In the next few years, it is estimated that there will be over 5 million people receiving health care in the home setting contributing to a $157 billion industry by 2022. To ensure that HAI are prevented in all health care settings, stakeholders, like CMS, CDC, and Medicare-certified HHAs should set a timeline to use standard surveillance definitions to conduct agency-level infection surveillance and report HAI information to NHSN for national surveillance efforts.

Chapter 5: Executive Summary

Introduction

An increase in the use of home health care (HHC) as an alternative to the traditional healthcare setting is spurred by innovative technologies that allow for improved quality of care at home and a need to cut costs. Although the home setting separates patients from many of the risks of infection exposure as compared to a facility-based setting, it is also uncontrolled and has a host of factors that have posed barriers to effective infection prevention and surveillance. As HHC becomes more commonplace, healthcare-associated infection (HAI) surveillance systems will also need to track and monitor infection prevalence and the impact of intervention efforts in this growing healthcare setting. With approximately 5 million people receiving health care at home, there is a need to gain a more complete picture of the true burden of HAI affecting patients.

The National Healthcare Safety Network (NHSN) is a nationally-focused HAI surveillance system implemented by the Centers for Disease Control and Prevention (CDC). Based on review of NHSN annual progress reports, it did not appear that the home setting was represented in NHSN HAI surveillance efforts.

Purpose and Aims

The purpose of this thesis project was to confirm that NHSN surveillance does not include HAI data from the HHC setting and determine if the literature describes possible data sources to create a more complete picture of HAI burden. There were five aims to this project:

- Describe how NHSN tracks HAI acquired in the home healthcare setting

- Describe the known scope and magnitude of HAI among patients receiving care at home
- Discuss the distinctive features of HAI data collection in HHC setting
- Develop a context diagram showing how HHC HAI data sources could be incorporated into NHSN
- Discuss whether or not data collection of HAI events in the home healthcare delivery setting should be pursued by stakeholders

Conclusion

The program evaluation and literature review confirm that HAI data from the HHC setting is not currently reported to the NHSN or used in HAI surveillance reporting. The literature called for the need for national or nationally-coordinated surveillance efforts, but none currently exist. The variability in how home health agencies define and identify infections makes it difficult to estimate the incidence and prevalence of HAI across HHC sites and establishing a baseline by site of infection is currently not possible.

Investigators have pointed to Medicare Outcome and Assessment Information Set (OASIS) data as a possible data source with a validated data collection process to integrate HAI reporting from home healthcare agencies. Reviewing specific data elements of the OASIS data set, there does appear to be a viable option to enhance HAI surveillance with data on infection events attributable to the HHC setting.

Background

Morbidity and mortality associated with unintentional exposure to bacteria and viruses in healthcare settings is a public health problem in the United States. Known as healthcare-associated infections (HAIs), these infections are defined as *"infections that develop in a*

patient who is cared for in any setting in which healthcare is delivered (e.g., acute care hospital, chronic care facility, ambulatory clinic, dialysis center, surgicenter, home) and is related to receiving health care (i.e., was not incubating or present at the time healthcare was provided)". These infections range from those resulting from the use of central lines, indwelling catheters, and respiratory ventilators, to exposure to healthcare professionals and others who are not appropriately vaccinated or who do not follow proper hand-hygiene procedures. A recent study in the New England Journal of Medicine estimated that the burden of HAI was 721,800 infections affecting approximately 648,000 patients in acute care hospital setting in 2011. To provide context of the scale of this burden, there were approximately 36 million admissions to acute care hospitals based on the American Hospital Association's 2012 Annual Survey data. Magill, et al. assessed the burden of HAI in the acute hospital setting, but there are other settings where patients receive health care such as outpatient clinics, long-term care facilities, and the home.

Although the home setting geographically separates patients from many of the risks of infection exposure as compared to a facility-based setting, there are other factors that make infection control and prevention challenging. The home setting is uncontrolled, there is variability in the level and quality self-care and from relative caregivers, there is evidence of a lack of continuity of care and communication between sites and clinicians, and there is limited capacity to collect numerator and denominator data to calculate a baseline for infection surveillance and control. It is difficult to measure the magnitude of HAI in the HHC setting because there are inconsistencies in the definitions used to classify infections among home healthcare agencies and few published studies have looked across more than one agency and more than one infection type.

Approach

There were two main phases to this thesis project. The first phase focused on confirming or rejecting the hypothesis that NHSN does not include HAI data from the HHC setting. The second phase focused on understanding the current landscape and what the literature contained regarding HAI surveillance in the HHC setting.

The evaluation approach employed a content analysis method and an iterative approach to data collection, analysis and reflection to confirm or reject the null hypothesis – that NHSN surveillance does not include HAI data from the HHC setting.

Recommendations

This project has highlighted the possibility that Medicare OASIS data could be a useful data source for filling the HAI surveillance data gap. Clearly, there are viable options to enhance national-level HAI surveillance with HHC data. There are valid concerns about the ability to control a home environment to adequately identify and prevent HAI events. However, the public health community has developed surveillance definitions that account for the factors that limit infection control in the home. Future studies and efforts should explore whether OASIS data is appropriate for HAI surveillance. A pilot investigation could be undertaken using OASIS data. Additionally, there are opportunities to develop and disseminate resources to support the standardization of infection identification and control efforts among Medicare-certified HHAs.

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