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Using Workflow Diagrams to Address Hand Hygiene in Pediatric Long-Term Care Facilities¹

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Abstract

Hand hygiene (HH) in pediatric long-term care settings has been found to be sub-optimal. Multidisciplinary teams at three pediatric long-term care facilities developed step-by-step workflow diagrams of commonly performed tasks highlighting HH opportunities. Diagrams were validated through observation of tasks and concurrent diagram assessment. Facility teams developed six workflow diagrams that underwent 22 validation observations. Four main themes emerged: 1) diagram specificity, 2) wording and layout, 3) timing of HH indications, and 4) environmental hygiene. The development of workflow diagrams is an opportunity to identify and address the complexity of HH in pediatric long-term care facilities.

Keywords

Workflow diagrams; Hand hygiene; Pediatric long-term care

PEDIATRIC LONG-TERM care facilities provide medical, social, academic, and rehabilitative care to children with complex health needs, and face various infection prevention challenges, which may render children particularly susceptible to infection. In our previous work, for example, we found sub-optimal adherence to recommended hand hygiene (HH) guidelines (43%, 370/865) in several pediatric facilities in the New York metropolitan area (Buet et al., 2013). Based on findings from this previous study as well as

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the work of Son et al. (2011), our aim was to engage staff in the development of workflow diagrams, which highlighted HH practices during commonly performed patient-care activities. Our secondary aim was to validate these workflow diagrams through the direct observation of workflow tasks and elicit staff feedback on workflow diagram content and format.

Methods

This investigation was part of a larger funded study aiming to reduce infections and improve the safety climate and HH practices among three pediatric long-term facilities in the New York City metropolitan area: a 97-bed subacute rehabilitation and long-term care facility; a 54-bed long-term care and rehabilitation facility; and a 137-bed subacute long-term care facility. In February 2013, under the direction of each facility's infection preventionist, multidisciplinary Keep It Clean for Kids (KICK) teams at each of the facilities convened. Participation was voluntary. KICK team members were self-identified or chosen by the facility infection preventionist to include both clinical and non-clinical personnel. Teams consisted of 5–16 members, and included nurses, nursing assistants, physicians, teachers, housekeepers, respiratory, physical, occupational and recreational therapists. Each team was responsible for developing step-by-step workflow diagrams of commonly performed tasks that highlighted HH practices according to the World Health Organization (WHO) 5 Moments (Pittet, Allegranzi, & Boyce, 2009). At each site, 3–4 workflow diagrams were developed by small breakout groups of 2–4 members each. Draft diagrams were shared with each facility's larger KICK team and infection preventionist to review diagram content and ensure accordance with the institution's infection control policies. Using an iterative process, KICK team members discussed and amended draft workflow diagrams until consensus was reached.

In summer 2013, the workflow diagrams developed by the KICK teams were validated via direct observation and staff feedback. Two researchers, trained in the WHO 5 Moments, performed real-time observations of each workflow activity while concurrently assessing its respective workflow diagram. Observers recorded whether the workflow diagrams included the actions performed by staff, whether the order of steps was accurate, and made note of additional activities observed. After real-time observations, researchers solicited workflow diagram feedback from staff by asking open ended questions such as, “How useful is this diagram in knowing when to do hand hygiene?” Observers documented a summary of staff comments and validation findings on the diagram of the observed activity. Participant demographics were purposefully not collected to facilitate staff participation. To ensure inter-rater reliability in the conduct of observations, researchers independently observed and validated two workflow activities. Findings were compared and discussed to consensus. Upon completion of workflow diagram observations, one observer synthesized observation findings. Synthesized findings were subsequently reviewed and agreed upon by the second observer and all study co-authors. Diagrams were modified based on these results.

The research team's institutional review board and the institutional review boards of all three pediatric long-term care facilities approved this research with a waiver of documentation of informed consent for KICK teams. Families received informational fliers and newsletters

informing them of the larger HH improvement initiative at all three facilities. Because workflow diagrams focused on specific aspects of clinical care, families were not involved in diagram development.

Results

In developing workflow diagrams that highlighted HH, multidisciplinary KICK teams identified important considerations for HH e.g., multiple HH indications may be needed during a single workflow activity and that the reorganization of workflow may help to minimize the number of HH indications. KICK teams incorporated these considerations in the development of workflow diagrams.

Across all three sites, the multidisciplinary KICK teams developed workflow diagrams for six different activities: a respiratory therapy session, physical therapy session, diaper change, group activity, infant massage, and oral feeding (Figure 1). Some activities were diagrammed by more than one facility. In these cases, study researchers compared diagrams and chose the diagram with optimal design, while seeking feedback and approval from each site's infection preventionist. Following workflow diagram development, two researchers performed 22 observations of the activities depicted in the workflow diagrams (mean observations per activity: 4; mean observations per site: 7). See Table 1 for the number of observations conducted per site.

Four main themes emerged during validation observations: 1) diagram specificity; 2) wording and layout; 3) timing of HH indications; and 4) environmental hygiene (Table 2). Diagram specificity referred to the potential lack of relevance of the diagrams for different types of patients (e.g., different ages or disabilities) or for different settings where the activities occurred (e.g., school or patient room). For example, certain elements of workflow diagrams specific to ambulatory children were difficult to generalize to children that were non-ambulatory. Wording and layout referred to the diagrams' visual appearance and text, as we noted that the descriptions of the workflow activity were more prominent than the HH reminders. Timing of HH indications referred to the inconsistent, and sometimes inappropriate, timing of HH indications within workflow activities. With regards to performing HH after bodily fluid exposure, some diagrams indicated that HH should occur immediately after bodily fluid exposure whereas other diagrams indicated that HH should be performed after the completion of the activity. Similarly, environmental hygiene referred to the inconsistent inclusion of relevant environmental hygiene (e.g., cleaning work surfaces and equipment) across diagrams.

Based on the validation findings, a series of solutions were proposed (Table 2).

Discussion

While few studies have evaluated HH in pediatric long-term care facilities, two recent publications signal the need for improved infection prevention practices in this care setting. Buet et al. (2013) used the WHO 5 Moments to observe HH in four pediatric extended care facilities and found that overall HH compliance was sub-optimal (43%, 370/865). In the same year, the Society for Healthcare Epidemiology of America published the first infection

prevention and control guideline for pediatric residential facilities (Guzman-Cottrill et al., 2013). Our work around the development of workflow diagrams to address HH builds upon publications in this area.

In developing workflow diagrams that emphasized HH, clinical and non-clinical personnel discussed recommended HH practices and found that staff was surprised that a single interaction with a child could require multiple HH indications, aside from simply performing HH before and after contact with the child. In addition, staff commented on the need to minimize the number of HH indications by collecting all supplies before beginning an activity and ordering tasks so that the “cleaner” procedures are done prior to “dirtier” ones.

KICK teams also noted that the common sharing of items (e.g. toys and books) during group activities created additional opportunities for the potential spread of infections.

Consequently, KICK teams recommended that shared items be cleaned between uses and recommended that the hands of children be cleaned prior to engaging in group activities. The Society for Healthcare Epidemiology of America's infection prevention and control guideline for pediatric residential facilities also acknowledges the importance of HH among residents and further advises that shared items be chosen based on their ease of cleaning and disinfection (Guzman-Cottrill et al., 2013). These recommendations acknowledge that infectious organisms may be spread by both indirect and direct contact (i.e. environmental exposure and person-to-person spread) (Guzman-Cottrill et al., 2013) and underscore the intricacy of infection prevention in pediatric long-term care facilities.

Additional HH considerations were noted during validation exercises. Observers noted that workflow in pediatric long-term care facilities is complex and dependent on several factors (e.g. setting of care activity and developmental stage of child receiving care). The frequent movement of children from individual rooms to group settings added to the complexity of workflow in this environment and the number of HH indications. A recent study found that HH compliance may be improved by streamlining workflow and minimizing HH indications (Scheithauer et al., 2013). While KICK teams took care to streamline activities when developing workflow diagrams, the primary aim of the teams was to indicate when HH should occur, not to modify the actual process of work. Thus, the modification and optimization of workflow may be an important step to improve HH compliance in this care setting.

After completing the diagrams, sites implemented them in various ways; one site, for example, created laminated posters which were displayed prominently in patient care areas. We also discussed the implementation of the diagrams with the original proponent (Son et al., 2011), who noted that while staff may not use the diagrams consistently, diagrams are valuable as an adjunct to new employee orientation and serve as a ‘booster’ reminder during annual infection control educational sessions. The greatest advantage of the diagrams however, was the enthusiasm and awareness created among frontline personnel who had not been previously invited to lend their voice to improving HH behavior.

Our next goal is to evaluate the diagrams in the context of a larger study, but this poses considerable challenges. Since the diagrams are one component of a multi-year and multi-

factorial intervention trial designed to improve the organizational safety climate and reduce infections, it is not possible to determine whether any changes in infection rates or HH compliance are attributable specifically to the workflow diagrams. Additionally, since many of the infections in these facilities occur as outbreaks of viral upper respiratory infections, it is essential that infection surveillance continues over several epidemic periods (e.g., influenza or rotavirus season) before valid conclusions about the impact of interventions can be made.

Because this study was conducted in three sites that were already participating in a focused effort to improve HH, findings regarding specific outcomes may not be generalizable. Nevertheless, we found that the development of workflow diagrams by a team of clinicians and non-clinicians increased mindfulness and active participation among staff in understanding and improving HH practice. We also confirmed that such diagrams may be tailored to pediatric long-term care facilities. In conclusion, the development of workflow diagrams is an opportunity to engage staff in identifying and addressing the complexity of HH in the pediatric long-term care environment.

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Workflow Diagram: PO Feeding

Figure 1.
Original oral feeding workflow diagram.

Table 1

Number and types of workflow activities observed across sites

Workflow diagram	Site 1	Site 2	Site 3	Total activities observed across facilities
Infant massage *	1	0	0	1
Physical therapy	1	2	1	4
Respiratory treatment	1	0	1	2
Oral feeding	3	1	2	6
Diaper change	2	1	1	4
Group activity	1	2	2	5
Total activities observed in each facility	9	6	7	22

Note. All numbers are raw counts;

* infant massage only available at site 1.

Table 2

Findings from workflow diagram validations and proposed solutions

Theme	Observations	Proposed solutions
Diagram specificity	<ul style="list-style-type: none"> • Much of the language included in workflow diagrams is particular to a child's age or developmental stage. • The sequence of workflow activities are very specific and differ according to whether a child is in the school setting, a public area, or his or her room. 	<ul style="list-style-type: none"> • Avoid age-specific and developmental-specific language (e.g., stroller, wheelchair). • Avoid workflow elements that may be specific to a particular location of activity (e.g. changing table, mat).
Wording and layout	<ul style="list-style-type: none"> • The wording of workflow items are in bold and are in a larger font size than hand hygiene reminders. • There is a great deal of wording on the diagrams that detail staff workflow and the specific reason for hand hygiene. Some of this information may not be necessary and cause difficulty for the reader. • Many of the diagrams concentrate on a child's movement to and from his or her room. 	<ul style="list-style-type: none"> • Simply for staff - use broad language to describe workflow. • Use arrows so that staff can easily understand the sequence of events. • Emphasize hand hygiene moments in the layout of sequences by increasing font size or bolding text. • Delete the specific reason for hand hygiene. General hand hygiene rules may be included in a separate section of the workflow diagram.
Timing of hand hygiene	<ul style="list-style-type: none"> • The timing of hand hygiene indications is not consistent across diagrams. 	<ul style="list-style-type: none"> • Recommend that hand hygiene be performed in a consistent manner (e.g. immediately after bodily fluid exposure).
Environmental hygiene	<ul style="list-style-type: none"> • Environmental hygiene is inconsistently included across workflow diagrams. 	<ul style="list-style-type: none"> • Consistently include environmental hygiene recommendations across diagrams.