

CAMERA OBSERVATION SYSTEMS AND THE FEEDBACK ON THE HAND HYGIENE IMPROVEMENT STRATEGY AT THE NATIONAL CHILDREN'S HOSPITAL 2015

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Abstract: Hand hygiene monitoring and the feedback to healthcare workers is one of the most effective ways to improve handhygiene compliance following WHO guidance. Direct monitoring is considered "gold standard" but it is affected by "Hawthorne effect". Remote video auditing (RVA) is a method using cameras installed in preferred places to record handhygiene practice and then give feedback to whom it is meant for and other related peopl. North Shore study shows no difference between 4 first weeks (30,42%) and the 16 weeks monitoring in hand hygiene compliance by RVA feedback, but this rate increased to 80% from the 17th to 48th week . From March 2015, RVA was used in The National Hospital for Pediatrics with 7 cameras observing handhygiene compliance in the ICU.

Key words: remote video auditing, video surveillance hand hygiene, hospital associate infection.

I. BACKGROUND

According to World Health Organization's cognizance (WHO) "appropriate hand hygiene and the correct application of basic precautions during invasive procedures, are simple and low-cost in intervention of "nosocomial" or "hospital" infection". Many studies on hand hygiene compliace in the World assessed the risk of hospital infection at health facilities.

Monitoring hand hygiene compliance and giving timely feedback on hand hygiene pratices to health-care workers (HCWs) is of crucial importance to multimodal hand hygiene improvement strategy recommended by WHO. In their efforts to hand hygiene compliance improvement, there have been applied many methods. Direct observation of hand hygiene

practices by a trained observer is generally considered the gold standard for evaluating compliance. However, data derived from a very limited time of observation of health-care workers during their routine activities are meager. Moreover, direct observation is more likely to be under the influence of "Hawthorne Effect" - that is a type of reactivity agaist observation in which individuals modify or improve an aspect of their behavior in response to their awareness of being observed. As a matter of fact there were very few hand hygiene opportunities that "caught red-handed". The study of North-Eastern community hospital in the US (2012) using the direct observation method of measuring the monthly rate of hand hygiene compliance was approximately 64% - 78,8% [1] [2]. Another method to assess hand hygiene is the

measurement of the consumption of hand hygiene products and serve as a surrogate for direct observation; this method is recognized much less time-consuming and giving helpful information related to the number of a HCW's handwashing, but this method's draw back is not to know who is "object" and the instance of hand hygiene practices performed to promote hand hygiene compliance. The study of Sao Paulo hospital, Brazil (2013) assessed hand hygiene by two different methods: direct observation, electronic counting and measurement of the consumption of hand hygiene showed that the compliance rate of direct observation method was 70,7%; the used volume of alcohol gel consumption showed a compliance rate was 93.3% compliance rate [3][4][5]. Besides another method of measuring the compliance rate at hospitals in the World was camera observation (RVA), a method of measuring through records by camera at observation sites in the ICU as well as providing real-time records of hand hygiene practices to the compliance of HCWs' hand hygiene. The Study of North Shore University assessed in the first 4 weeks of using RVA method but no feedback given, the compliance rate was 30,42%, monitoring in 16 succeeding weeks, there's still no feedback of the compliance rate that improved significantly, as from the 17th week to the 48th week by using RVA method and feedback of the compliance rate was 80%. [1][2].

In our efforts to improve hand hygiene compliance, in March, 2015, National Children's hospital started using a method of measuring hand hygiene compliance through camera observation. Seven cameras were installed in the Intensive Care Unit. Camera observation systems were connected with local Area Network for HCWs' dynamic image when they were doing their routine work. The application of new technology in surveillance system is one of the solutions of promoting the

compliance of infection control practices in the hospitals set-on this strategy. The purpose of this study is to:

1. Define HCWs' hand hygiene compliance rate in the ICU through camera observation.
2. Compare HCWs's hand hygiene compliance rate in the ICU by camera observation with traditional observation method.
3. Describe the improvement of hand hygiene compliance rate has effect on in the ICU's hospital infection rate.

II. METHOD OF STUDY

1. Object of Study: Health-care workers in the Intensive Care Unit

2. Method of Study:

2.1. Design of Study: Observation and comparison

2.2. Place of Study: Intensive Care Unit

2.3. Time of Study:

The study's conducted for 12-week period from 01/3/2015 – 31/5/2015 and in two episodes:

+ Episode 1: Prior to feedback episode. Hand hygiene rates assessed in 04 weeks (01/3/2015 – 31/3/2015) through camera observation system with no feedback given from observation data

+ Episode 2: Feedback episode. Hand hygiene rates are measured in 08 weeks (01/4/2015 – 31/5/2015) through camera observation and giving feedback of observation data.

3. Data Collection

Observation activities were conducted by observers who were infection control staff in the network or specialists in the field. Observation time was performed within 20 minutes/time of a camera and time changing in the day (8:30 am – 16:30 pm) from Monday to Friday except days off and holiday. Observers

kept track of hand hygiene opportunities at 5 different time intervals and WHO's Observation Form. in which:

+ Hand hygiene compliance opportunities (%)

$$= \frac{\text{Hand hygiene compliance rates}}{\text{Total observation opportunities}} \times 100$$

+ Incidence rate of hospital associate infection:

$$= \frac{\text{New hospital infection cases}}{\text{Total in-patients}} \times 100$$

4. Data analysis:

Trouble-shooting and insertion data by Microsoft Office Excel 2010.

Parameters're shown as frequency and percentage (%); application verification χ^2 to make a comparison of parameters.

III. RESULT OF STUDY

1. Hand hygiene compliance rate by the 2 different observation methods at Episode 2

Table 1. Comparing hand hygiene compliance rates by 2 methods of observation

<i>Observation Method</i>		<i>Episode 1 Prior to feedback</i>	<i>Episode 2 Feedback</i>	<i>Value χ^2, P</i>
Direct Observation	N	147/195	270/367	$\chi^2 = 0.22$ P = 0.63
	%	75.3%	73.5%	
Camera Observation	N	527/1571	557/838	$\chi^2 = 23.9$ P < 0.001
	%	33.5%	66.4%	

2. Hand hygiene compliance rate at 5 different time intervals

Table 2. Comparing hand hygiene compliance rate in 2 Episodes

<i>5 time intervals</i>		<i>Episode 1 Prior to feedback</i>	<i>Episode 2 Feedback</i>	<i>χ^2, P</i>
Prior to connect with a patient	N	179/435	150/248	$\chi^2 = 23.6$ P < 0.001
	%	41%	60.4%	
Prior to aseptic procedures	N	59/352	31/46	$\chi^2 = 59.5$ P < 0.001
	%	17%	67.3%	
After connecting with a patient's secretion	N	21/37	23/30	$\chi^2 = 2.9$ P = 0.08
	%	57%	76.7%	
After connecting with a patient	N	252/498	142/196	$\chi^2 = 27.3$ P < 0.001
	%	51%	72.4%	

After connecting with a patient's surroundings	N	126/608	33/64	$\chi^2 = 30.5$ P < 0.001
	%	21%	51.6%	

1. Hand hygiene compliance rate related to titles by camera observation.

Table 3. Comparison of hand hygiene compliance rate related to titles through 2 Episodes

Title	Episode 1 Prior to feedback	Episode 2 Feedback
Doctor	33%	43.4%
Nursing	31%	33%
Staff	32%	22.6%
Other	4%	1%

2. Compliance rate of Hand Hygiene Technique

Table 4. comparison of hand hygiene technique through 2 Episodes

Technique	Episode 1 Prior to feedback	Episode 2 Feedback
Step 1	67.8%	66.9%
Step 2	65.8%	64.5%
Step 3	43.6%	52.1%
Step 4	11.3%	44.6%
Step 5	9.9%	26.3%
Step 6	9.7%	22%
Technically correct (Sufficient 6 steps)	9.1%	17.7%

3. Hand hygiene compliance rate related to observation time slot

Stable 5: Hand hygiene compliance rate according to the observation time slot

Observation time		N	%	Giá trị χ^2 , P
Episode I	08:00 – 10:00	224/597	38%	$\chi^2 = 6.8$ P = 0.08
	10:00 – 12:00	66/202	33%	$\chi^2 = 0.08$ P = 0.77

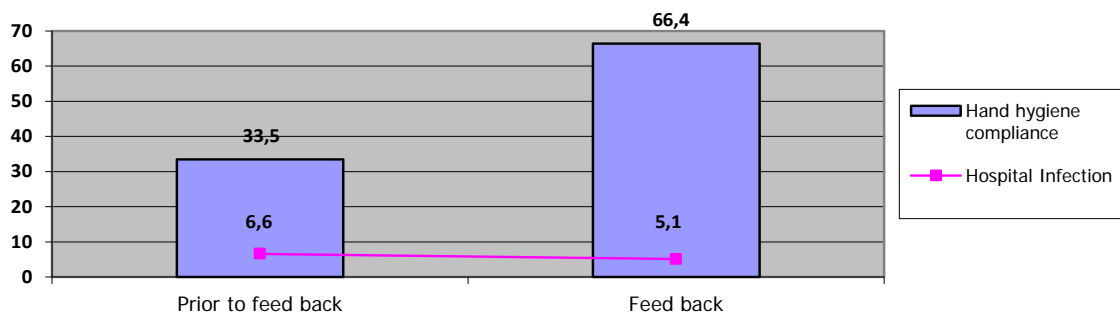
	13:30 – 15:00	159/495	32%	$\chi^2 = 0.66$ P = 0.41
	15:00 – 16:30	78/277	28%	$\chi^2 = 4.3$ P = 0.04
Episode II	08:00 – 10:00	78/112	69.4%	$\chi^2 = 1.33$ P = 0.24
	10:00 – 12:00	102/155	65.8%	$\chi^2 = 0.06$ P = 0.08
	13:30 – 15:00	72/126	57.1%	$\chi^2 = 4.5$ P = 0.33
	15:00 – 16:30	92/136	67.6%	$\chi^2 = 0.55$ P = 0.45

4. Optical hand hygiene method through 2 Episodes

<i>Hand hygiene method</i>	<i>Episode 1</i>	<i>Episode 2</i>	<i>Value χ^2, P</i>
	<i>Prior to feedback</i>	<i>Feedback</i>	
<i>Quick hand disinfection by alcohol gel</i>	331/527 (62.8%)	352/557 (63.2%)	P>0.05
<i>Hand washing using soap and water</i>	196/527 (37.2%)	201/557 (36.8%)	

5. The improvement of hand hygiene compliance has action on hospital infection rate through 2 Episodes.

Graph 1. Comparison between hand hygiene compliance rate with incidence rate of hospital associate infection through 2 Episodes



IV. DISCUSSION

1. The improvement of hand hygiene compliance rate by using camera observation system (RVA) and real-time feedback of hand hygiene practices in the Intensive Care Unit

During the study period, there were 2409 opportunities for hand hygiene assessed by camera observation and 562 opportunities for hand hygiene assessed by direct observation in the ICU. The result of observation for hand hygiene compliance in the first 4 weeks of

Episode 1 (no feedback) was 33.5%, in the consecutive 8 weeks after received feedback (Episode 2), the hand hygiene rates increase to 66.4% (statistically significant difference with $p < 0.001$). However, the comparison of hand hygiene compliance rates by direct observation with the overall rate of hand hygiene compliance was 70% and more and there was not much change recorded both episodes (the difference didn't make sense statistically with $P = 0.63 > 0.05$). It demonstrated that direct observation was influenced by "Hawthorne Effect", hence there were very few recorded opportunities of non-compliance. The above result was to match with New York North Shore hospital's study one when using video recorder to measure HCWs' compliance rate in the ICUs. In the 16-week period of camera observation without feedback. The compliance rate of hand hygiene recorded less than 10% and in the next 16-week period with the compliance rate of 81.6%. The rise of compliance rate was continuously maintained in the next 75 weeks with the compliance rate of 87.2% [2]. According to North-eastern community university's outcome in the US from Jan, 2012 to Mar, 2013 showed that the compliance rate of hand hygiene monthly assessed by direct observation was not changed much, approximately 63.5% - 69.5% prior to feedback and 64% - 78.7% after feedback started [6] [7].

Through records of camera observation system, the compliance rate of hand hygiene of 5 time intervals, the result of time interval of "prior to the aseptic procedure" that recommended by WHO to obtain the optimal compliance had the lowest rate (17%) and the time interval of "after touching a patient's surroundings" was approximately 21%. This was the two time intervals that were always reported with the lowest compliance rate of hand hygiene. However, in this study at episode 2 after observing and giving feedback to HCWs, so the compliance rates of hand hygiene at two time intervals were improved significantly and impressively from 17% to 67.3% and 21% to 51.6% (the difference made sense statistically with $P < 0.05$). The same study in Japan, according to H.Kunishima and his colleagues recorded through camera observation, the compliance rate at time interval of "prior to the aseptic procedure" was solely 25.2% and after feedback of the compliance rate of "prior to the aseptic procedure", the compliance rate was increased up to 33.8% [1]. The observation results also recorded the technically correct compliance rate of hand hygiene (sufficient 6

steps) according to Ministry of Health of Vietnam's hand hygiene procedure at 2 episodes with a low rate of 20%, it said that though reminders and the rise of HCWs' awareness of hand hygiene compliance, however the performance was not yet a habit of standard practice. The assessment of hand hygiene compliance object, observing through camera screen at 2 episodes recorded that doctors had the highest compliance rates (33% episode 1 and 43.4% episode 2). These results differed with some other studies' results that believed the lowest compliance rate were doctors. Through 476 hours of camera observation, hand hygiene opportunities recorded with no significant change of observation time, this was more likely to work shift in the ICU, so time marks of observation recorded hand hygiene opportunities were the same. Hand hygiene method chosen by HCWs mainly were 60% alcohol gel at both episodes.

2. The improvement of hand hygiene compliance with hospital infection

During the study period, the hospital infection rates at ICU reported to fall down from 66/100 patient-days at Episode 1 down 51/100 in-patients per day at Episode 2. So when hand hygiene rates increase 9.8 times (from 33.5% to 66.4%) as a result of hospital infection rates were to fall down 0.22 times, at a time interval of study recorded incidence rate of hospital associate infection at ICU according to surveillance report of hospital infection case with no new hospital infection case reported. So by recognizing exactly of hand hygiene compliance rates and giving feedback of compliance result to HCWs so that help them not only to improve hand hygiene compliance awareness but also enhance other compliance of practices. Efficiency of the observation system had effect on preventing risks of hospital infection.

It can be said that the use of camera observation systems and received feedback received from HCWs' hand hygiene practices was one of multimodal approaches in WHO's strategy and was a effective solution in our efforts of improving the practice compliance to prevent hospital infection, it had been applied and achieved high efficiency at National Children's hospital now.

V. CONCLUSION

Carrying out the observation study of 2049 hand hygiene opportunities were measured through camera observation systems and 562 hand hygiene opportunities being measured

through direct observation at ICU. Hand hygiene compliance rates through camera observation method at the Episode with no feedback increase from 33.5% to 66.4% after received feedback. Hand hygiene compliance rates of direct observation method reported change insignificantly at both episode. The optimal efficiency among 5 time intervals recommended by WHO was “Prior to aseptic procedures” after received feedback improving from 17% to 67.3%. The most compliance objects of observation were doctors. Technically correct hand hygiene compliance with low rates of 17.7%. Hand hygiene method chosen by HCWs was mainly quick disinfection with alcohol solutions. When hand hygiene compliance rates increasing up to 9.8 times, as a result of hospital infection rates falling down 0.22 times. Hand hygiene compliance rates reported no difference of observation time through camera.

VI. RECOMMENDATIONS

The combination of observing and giving feedback of hand hygiene compliance practices were proved the improvement of HCWs' compliance significantly and steadily. The main point of the study is to prove that this technology is able to observe and consolidate HCWs' hand hygiene behaviour for a long time. Camera observation method and continuously give feedback of hand hygiene practices to HCWs is more likely to match compared with the traditionally direct observation method. This technology is completely able to apply for other applications of technical compliance practices such as infection control compliance observation in central venous catheter placement technique, nursing care procedure...this is the significant innovation in multi-modal hand hygiene improvement strategy at National Children's hospital. Applying for and enlarging this technology in patient safety establishment strategy to Managers to assess effectiveness in their efforts of reducing hospital infection rate.

VII. REFERENCES

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