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## Research Article

### INFECTION CONTROL MEASURES STATUS AND EFFECT OF TRAINING SESSIONS AMONG HEALTH CARE PROFESSIONALS IN MULTISPECIALTY TEACHING HOSPITAL, MANGLORE, INDIA

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#### ABSTRACT

**Introduction:** Infection control measures are the focus of quality care by health care sector, as control of health care associated infections will improve the morbidity status and can also prevent mortality. Periodic review of health care personnel's in this regard will go a long way in identifying weakness and strengthening them. Therefore this study was taken up to measure the awareness, practice, attitude and hand hygiene measures related to infection control and test the role of practice based intervention program among health professionals working medical and surgical units of multispecialty hospitals.

**Methods:** The research approach adopted for the study was quantitative approach. Purposive sampling was done and 30 health professionals were selected for the study. Self-administered questionnaires on Knowledge, attitude, infection control and Observational check list related to infection control measure compliance and infection control practice were used to collect data.

**Results:** The overall pretest and posttest mean knowledge of only nurses was found to be 17.2+5.20 and 37.2+2.78 respectively indicating the enhancement knowledge significantly ( $p=0.01$ ). Even practice and attitude also significantly improved suggesting that practice based intervention programme was impactful among nurses. The findings on The other health professional- other professionals' infection control practice scores (87.7+5.31) seemed to be slightly better than that of nurses (84.4 +9.02). But the knowledge was average and attitude seemed to be good. Hand hygiene practices were good among both nurses and other health professionals.

**Discussion & Conclusion:** over all the in infection control knowledge level of nurses and other health professionals was just adequate compared to their good practice scores. The training programme was effective in improving the over-all score of the nurses related to the knowledge, attitude, and practice regarding infection control. Even other health professionals other professionals, surgeon, interns knowledge, practice was not high. Thus, it can be propose to train the all levels of health professionals on various aspects of infection control and introduce an on-going training program in the curriculum.

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#### INTRODUCTION

Prevention of infection should be taken seriously and regarded as a cost-effective measure. At least 5 -10% of patients admitted to acute care hospitals acquire an infection.<sup>1</sup> Hospital acquired infections exact a tremendous toll, resulting in increased morbidity and mortality, and increased health care

costs.<sup>2</sup> Compliance on the part of HCWs including medical students with standard/ universal precautions (SPs) and implementation of these measures has been recognized as efficient means to prevent and control HAIs.<sup>3</sup> Such measures not only protect the patient, but also the HCWs and the environment.<sup>4</sup> In developing countries, in spite of the

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effectiveness of these infection control practices, studies have shown a very low compliance by professionals and students alike.<sup>5,6</sup>

Guidelines about infection control measures are one of the strategies that have used to prevent the spread of infectious diseases. The primary aim of these guidelines, whether in the community or hospitals, is to prevent people from acquiring avoidable infection. Achieving this aim requires the willingness of all health care staff to maintain the highest possible standards of clinical practice and follow sound infection control principles <sup>(7)</sup>. Many teaching methods can be used to train the professionals regarding infection control like planned teaching programme implemented to improve the knowledge and practice of nurses regarding infection control measures in NICU was effective  $p=0.05$  ).<sup>(8)</sup>

The emergence of life-threatening infections have greatly highlighted the need for cost effective infection control programmes in all health care settings and capacity building for health professionals to effectively implement them. An infection control programme planned and implemented judiciously puts together various practice measures which, when used appropriately, restrict and controls the spread of infection.<sup>(9)</sup>

Therefore, the purpose of the present research paper is to study and analyze knowledge, attitude and practices towards infection control measures among health care personnel and nurses and to explore the effect infection control guidelines on nurses knowledge, practice and attitude on infection control measures in order to protect themselves and others from infection transmission.

## METHODS

The study was conducted in multispecialty teaching hospital in 2017. It had all the medical and surgical wards, specialitywards for patient care. The study was primarily conducted to assess the infection control pattern and the knowledge and attitude of health personnel including nurses. Primary data were collected through questionnaire on knowledge, infection control measures checklist, attitude scale, observation checklist. The sample of the study included 10 other professionals (senior residents, post-graduates, junior residents) and 20 nurses (sisters-in-charge, staff nurses and additional nursing superintendent) posted in the two wards. The tools were prepared based on the hospital-acquired infection guidelines provided by the World Health Organization(WHO) and Centre for Disease Control (CDC). The tools were pre-tested before data collection and proper approval was obtained from the appropriate authority prior to the study. The intervention on prevention of infection and infection control measures was done through use of multimedia and lecture cum discussion methods after conducting pre test for health professionals. But intervention and post test on 7<sup>th</sup> day was given only to nurses.

### Ethical approval

The study was approved institution ethical committee-A.J. Ethics Committee-Mangalore.

## RESULTS

### Description of sample characteristics

**Table 1** Distribution of nurses according to variables

Sl.No	Variables	Frequen cy(f)	Percentage (%)
1	Age(in yrs)		
a	20-30	20	100
b	31-40	-	-
2.	Gender		
a.	Male	-	-
b.	Female	20	100
3.	Area		
a.	Medical	-	-
b.	Surgical	18	90
c.	Ortho	2	10
4	Experience		
a.	<1year	12	60
b.	1-3 years	4	20
c.	3-6 years	2	10
d.	>6years	2	10
5	Workshift		
a.	Long Day	6	30
b.	Night shift	14	70
6	Participation in in-service education		
a.	One Day	10	50
b.	Two Days	2	10
c.	Three days	-	-
d.	>three days	2	10
e.	None	6	30
7	Duration of In-service Education		
a.	0-6 months	12	60
b.	6-1year	-	-
c.	>1year	6	30
d.	Not applicable	2	10

**Table 2** Distribution of other professionals according to variables

Sl.No	Variables	Frequency(f)	Percentage(%)
1	Age		
a	20-30	8	80
b	31-40	2	20
2.	Gender		
a.	Male	5	50
b.	Female	5	50
3	Discipline		
a	Physicians	1	10
b	Surgeons	2	20
c	Interns	2	20
d	post graduates	5	50
3.	Area		
a.	Medical	1	10
b.	Surgical	9	90
c.	Ortho		
4	Experience		
a.	<1year	5	50
b.	1-3 years	5	50
6	Workshift		
a.	Long Day	6	60
b.	Night	1	10
c.	Alternate	3	30
6	Participation in in-service education		
a.	One Day	4	40
b.	Two Days	-	-
c.	Three days	-	-
d.	>three days	-	-
e.	None	6	60
7	Duration of In-service Education		
a.	0-6 months	1	10
b.	6-1year	1	10

c.	>1year	2	20
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Data in table 1 depicts that all the samples were females and in the age group of 20-30yrs. Majority worked in the surgical wards (90%) in night shifts (70%). Majority had less than 1 year of professional work experience (60%) and only 30% had not yet participated in the in-service education programme. This may be due to the fact that they had joined less than 1 year ago to the hospital and hospital was offering in-service education programme on regular basis as evidenced by 50% of staff nurses having participated in the training programme. Majority of the nurses(60%) had participated less than 6 months ago. In table -2 the data revealed that equal number of male and female other professionals(50%), but majority (80%) in the age group of 20-30 participated in the study. Majority worked in the surgical wards (90%) and in long shifts (60%). Contrary to the nurses majority of them (60%) had not participated in the in-service education programme.

**Infection Control measure of health professionals**

It was measured by using Infection Control measure checklist

**Table 3** infection control practices scores of nurses and other professionals

		Range	Mean+SD	Median	t test	p value
Nurses	Pretest	62-92	84.4 ±9.02	88	-2.470	0.036
	Post test	88-93	91±1.49	91		
Other health professionals	Pretest	78-94	87.7±5.31	88	-	-

Data in table 3 depicts that the post test scores(91±1.49) of infection control practice scores of nurses were higher than that of their pre test scores(84.4 ±9.02) significantly (p=0.036). Compared to nurses other professionals' infection control practice scores (87.7±5.31) seemed to be slightly better than that of nurses (84.4 ±9.02). Over all the infection control practice is good among both nurses and 2other professionals. After the intervention programme nurses practice had improved slightly suggesting training programmes strengthens the good practice methods on infection control.

**Attitude of health professionals towards infection control measures**

**Table 4** Attitude levels of nurses and 2other professionals toward infection control practice

	Attitude Level	Pre test		Post test	
		Frequency (f)	Percentage (%)	Frequency (f)	Percentage (%)
Nurses	Negative(0-65)	2	10	-	-
	Positive(66-130)	18	90	20	100
Other health professionals	Negative(0-65)	-	-	-	-
	Positive(66-130)	10	100	-	-

Data in table 4 also revealed that attitude level of both the nurses and 2other professionals were positive towards infection control measures and the post test conducted among nurses also showed that intervention motivated the 10% of nurses who were with negative attitude.

**Table 5** Attitude scores of nurses and 2 other professionals toward infection control practice

		Range	Mean+SD	Median	t-test	Significance
Nurses	Pretest	65-118	88.7 ±16.34	88	6.66	0.001
	Post test	114-126	121± 4.32	123		
other professionals	Pretest	83-125	98.9± 10.8	98	-	-

In the beginning of the study as per the data in table 5 it is evident that other health care workers' attitude score (98.9± 10.8) was better than that of nurses (88.7±16.34). But it is critical to emphasize that after the practice based intervention programme the attitude scores of nurses(121± 4.32) increased more than that of other health care professionals. Even on the comparison the post test scores of nurses were significantly higher than that of their pre test scores, 't'=6.66,p>0.001.

**Knowledge level of health professionals on infection control measures**

**Table 6** Awareness of nurses and 2other professionals toward practice of infection control measures

		Range	Mean+SD	Median	t value	Significance
Nurses	Pretest	8-23	17.2±5.20	19	8.86	0.001
	Post test	30-40	37.2±2.78	38		
other professionals		14-38	26±6.53	27.5	-	-

Max Score=41

The study showed that overall the awareness of nurses (17.2±5.20) and health professionals (26±6.53) were not at the expected level of practising professionals. (table-6)

But after the practise based intervention programme nurses had improved their awareness on infection control as evident for the post test knowledge scores(37.2±2.78), suggesting intervention is effective(p=0.001)

**Table 7** Awareness level of nurses and other health professionals in practice of infection control measures

	Nurses (n=20)		Other health professionals(n=10)
	Pre test f (%)	Post test f(%)	
Levels			
Good(28-41)	-	10	5(50)
Average(14-27)	16(80)	-	5(50)
Poor(0-13)	4(20)	-	-

Awareness level of nurses and other health professionals were average in spite of their infection control practice being good. But nurses improved their awareness after intervention programme (100%).(table -7)

**Infection Control Measure Compliance**

Compliance to infection control was measured by observational check list related to infection control measure compliance.

**Table 8** Compliance of nurses in practicing of infection control measures before the intervention<sup>a</sup>

Sl no	Compliance Activity	Always	Usually	Sometimes	Seldom	Never
1	Hand washing when comes in contact with different patients	15	35	30	20	-
2	after taking off the gloves	25	25	30	20	-
3	immediately after contacting any body fluids	50	20	15	15	-
4	while collecting Blood sample	45	30	25	-	-
5	before and after any procedure and patient contact.	35	20	30	15	-
6	Wears mask when performing operations/ procedures	45	25	20	10	-
7	Wears protective eye patch or goggle when performing operations/procedures	-	10	10	50	30
8	Wears protective suit or gown when performing operations/ procedures	-	10	50	10	35
9	Doesn't recap syringe after using.	55	15	15	15	-
10	Handles sharp instruments with care	50	20	20	10	-
11	Disposes needles and blades in a sharp disposal box or puncture proof container	60	25	15	-	-
12	Disinfecting equipment with disinfectants.	65	15	15	5	-
13	Segregate waste in appropriate color coded bins.	50	20	25	5	-
14	Wear the gloves in the following operations					
-	Blood drawing	50	20	5	15	10
-	Collection and Disposal for stool & urine	35	25	25	15	-

-	Contacting mucosal surfaces.	25	30	35	10	-
-	Contacting the non-intact skin.	40	20	35	5	-
-	Saliva culture	25	25	25	15	10
-	Invasive procedures.	30	20	25	25	-
-	Changing the dressing	55	15	15	15	-
-	Venous puncture	20	20	25	20	15
-	No return application of secured hand syringe or applying the return application with single hand.	-	10	60	10	20
-	Control line lost free of infection	-	25	25	30	20

a Data are presented as %.

Majority of the nurses complied with the infection control measures always and among the study subjects, the best tested performance was disinfecting the instruments always (65%) followed by disposes needles and blades in a sharp disposal (60%).(Table 8).

**Table 9** Comparison of compliance of nurses in practicing of infection control measures

	Range	Mean+SD	Median	t -value	Significance
Pretest	51-75	67.9±7.59	70	-10.90	0.001
Post test	95-98	96.1±1.28	95.5		

Data in table 9 show improvement in the compliance regarding infection control measures among studied group of nurses from pre-test level(67.9±7.59) to post level(96.1±1.28) and it was significant t=-10.9, p>0.001 .

**Table 10** Overall Level of compliance of infection control practice of nurses

Grading	Pre testf(%)	Post testf(%)
Good(70-100)	10(50)	20(100)
Average(36-69)	10(50)	-
Poor(1-33)	-	-

In post-test it is found that all the subjects had good compliance with the infection control measures in the hospital (table-10).

**Table 11** Overall Level of compliance of infection control practice of nurses

Sl.No	Events	Pre test		Post test	
		Hand wash with Soap & Water f(%)	Hand wash with disinfectant f(%)	Hand wash with Soap & Water f(%)	Hand wash with disinfectant f(%)
1	Prior to patient contact	8(40)	12(60)	-	20(100)
2	Prior to a clean or aseptic procedure	4(20)	16(80)	2(10)	18(90)
3	After contact with body fluids	4(20)	16(80)	2(10)	18(90)
4	After patient contact	-	20(100)	2(10)	18(90)
5	After contact with the patient environment	-	20(100)	-	20(100)

It is evident from the data in table -11 that all the nurses were washing hands either with disinfectant or with soap & water, and in most of the events use of disinfectants were preferred for hand hygiene. But after the intervention majority of the nurses started to use disinfectants over soap and water even after contact with body fluids (90%). As the disinfectants are readily available at the counters it was the preferred means of hand hygiene.

### Correlation between pre-testinfection control knowledge and practice and attitude of nurses

**Table 12** Correlation between pre test knowledge scores and attitude scores of nurses

Knowledge scores	Practice compliance
r value	0.713
p value	0.79

**Table 13** Correlation between pre test knowledge scores and attitude scores of nurses

Knowledge scores	Attitude scores
r value	0.899
p value	0.001

The findings in table 12 show that a significant positive correlation was found between knowledge and attitude scores of nurses(r-0.899, p=0.001). This indicates that a good knowledge on infection control can promote better attitude towards infection control measures in hospital. But data in table 13 showed weak positive correlation between knowledge and practice.

## DISCUSSION

Hospital acquired infection transferring among the patients of a hospital can be prevented by health professionals with proper disinfecting the skin, wearing gloves and masks, applying scientific measures, proper isolation, using the principles of standard precautions, observing hand hygiene, preventing accidental contact of hand with needle-stick and avoiding the infected respiratory discharges. As patient advocates, nurses are in the unique position to improve patient care standards. However, the results of the current study suggested that the majority of professionals under study had average knowledge about controlling hospital infections. Nurses' knowledge about hospital infection prevention specifically was not to the desired level. A research carried out among the nurses of Tehran had an intermediate level of knowledge on infection control<sup>(10)</sup>.

This results are in accordance with the results of study by, Angelillo in Italy <sup>(11)</sup> and Bota in Iran <sup>(12)</sup>. Even in a study conducted in Nigerian hospital the respondents (nurses) with a knowledge score above 60% were only 20 (10.2%)<sup>(13)</sup>. Even other health professionals like medical interns, medical students the overall awareness was were also average (64.6%)<sup>(14)</sup>.

In the present study findings even the infection control measure compliance among health professionals was average. This findings are highlighted in study conducted in Bahirdar, Ethiopia, where even though participants had better knowledge and positive attitude their practice of infection prevention was not optimum as per the national guidelines<sup>(15)</sup>. According to the Centre for Disease Control and Prevention (CDC, 2010) universal precautions are designed to prevent the transmission of blood borne pathogens when providing first aid or healthcare.

Positive attitude about infection prevention is the pillar to prevent cross infection. More than three fourth of the respondents (80%) had positive attitude about infection prevention which was very useful in promoting the nurses and health professionals to implement good infection control measures and comply with institutional guidelines. Good attitude can be attributed to the HIC departments' effort of reorienting the staff to great extent on infection control measures. A study in quart showed that attitude along with knowledge was inadequate suggesting need for multifaceted training programs in this regard<sup>(16)</sup>.

The practice based intervention programme implemented in this study only for nurses, significantly improved the knowledge, practice and attitude of nurses in the study. Specific areas like use of disinfectants of cleaning the equipment and capping the needles area, the practises showed implementation always. But after the intervention all the nurses had their practice in good grading category. This result is in agreement with other studies (17, 18) where higher level of knowledge was obtained in the post intervention phase as compared with the pre intervention phase.

After demonstration of guidelines regarding infection control and its measures, there were significant improvement in the level of knowledge about all general measures of infection control include hand hygiene, personal protective equipment, performance and attitude of internship nursing students (33) in Saudi Arabia(19). This reiterated in study conducted in Florida, which showed that nurses post education knowledge significantly improved ( $p > 0.05$ )(20). A study Egypt also emphasized that there is a highly significant improvement in the knowledge, positive attitude, infection control measures of nursing students after education (both post and follow up) than before education ( $p\text{-value} < 0.001$ )(21).

In the present study a significant positive correlation was found between knowledge and attitude scores of nurses( $r=0.899$ ,  $p=0.001$ ). A study conducted Indonesia also reported significant positive correlations between knowledge, attitude (22).

## CONCLUSION

So study results support the finding that application of specific intervention programmes are indeed effective for improving and refreshing knowledge, practice and attitude of nurses in any health care settings. Therefore, hospital administrators should provide support and resources in the form of education and training opportunities designed to increase the health care personnel awareness and application of infection control procedures.

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## Conflicts of interest

There are no conflicts of interest

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