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Original Article

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Physical Activity and Dietary Pattern Among Adolescents: A Cross-Sectional Analysis

Ramya K.R.[1]

Abstract

Background: Non Communicable diseases especially cardiovascular disease, diabetes mellitus, and stroke, have emerged as a major public health problem in India. Interplay of unhealthy diet, vitamin-D deficiency, tobacco use and physical inactivity contributed to this elevated risk among Indians. Also these life-threatening yet modifiable/reversible risk factors routes quite early in life. A clear understanding of the existing risk in the population is crucial for appropriate designing and timely (before the initiation of atherosclerosis) implementation of any preventive interventions to control the rising tide of non communicable diseases. *Aim:* Assess the physical activity and dietary patterns among school going adolescents. *Methods and Materials:* The study was conducted in Thrissur district, Kerala, using a cross sectional survey approach. Data were collected using a structured self reported questionnaire. Analysis (descriptive and inferential statistics) was done using SPSS version 20. *Results and Conclusions:* The mean age of adolescents participated in the study was 12.29±0.5 years, majority were boys (68.7%), and residing in rural area (74.6%). The mean dietary behaviour score was 32.71 ±3.32; boys 32.52±3.45, girls 33.13±2.3.There were no statistically significant differences in the mean score of dietary habits (t=0.127, p=0.899), dietary consumption (t=1.757, p=0.080), and total dietary behavior score (t=1.349, p=0.179) between boys and girls at 0.05 level of significance. The mean physical activity score was 1.76±0.3; boys 1.73±0.28, girls 1.77±0.31. Out of all, none of the boys and girls reported to have adequate levels of physical activity. Among them, 69% of them were actively commuting to school. A statistically significant higher number of boys were actively commuting to school when compared to girls (t=4.915) at 0.05 level. In conclusion, the findings from this study suggest that the physical activity and dietary behaviour among adolescents is largely inappropriate. So strategies need to be adopted from adolescent age itself to establish a lifestyle that promotes healthy levels of physical activity and eating behaviour.

Keywords: Non Communicable Diseases; Cardiovascular Disease; Physical Activity; Dietary Behavior; Adolescents.

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Introduction

Non Communicable diseases, especially cardiovascular disease, diabetes mellitus, and stroke, have emerged as a major public health problem in India. The morbidity and mortality in most productive phase of life is posing serious challenges to Indian society and economy [1]. Also compared to Western counterparts, in South Asian population experience a higher prevalence and a decade earlier onset of cardiovascular diseases owing to unique genetic predisposition and earlier exposure to risk factors [2,3].

Interplay of unhealthy diet (added high sugar and refined grains), vitamin-D deficiency, tobacco use and physical inactivity contributed to this elevated risk among Indians, especially in urban areas [4,5]. Rapid urbanization, increasing affluence,

international and rural-urban migration, changing age structure, and aggressive marketing have contributed to the changing lifestyles of people. In the recent decades, there is a marked increase in the intake of energy-dense foods, decrease in physical activity, and high level of psychosocial stress, all of which promote the development of dysglycaemia, hypertension, and dyslipidemia [6].

Also these life-threatening yet modifiable/ reversible risk factors routes quite early in life [7]. Recently, many studies have suggested that lifestyle changes in adolescents and young adults are necessary because of the increased tendency of various adverse health outcomes not otherwise typical for their age, including hypertension, dyslipidemia, and metabolic syndromes [8].

Recent studies show that adolescents tend to engage in a number of unhealthy eating behaviors, including extreme dieting, skipping meals, high intake of fast foods, low intake of fruits and vegetables, and minimal consumption of dairy products [9]. Only 54.8% consume green leafy vegetables more than once a week while 82.8% of the people consume at least one non-vegetarian dish a day [10].

It is known that children of ages 8 years, and under do not effectively comprehend the persuasive intent of marketing messages or the difference between commercial and non-commercial intents. Those as old as 11 years, also unless explicitly taught, may not be able to do so. But in the recent years the food and beverage industry has viewed children and adolescents as a major market force. As a result, children and adolescents are now the target of intense and specialized food marketing and advertising efforts. These foods related commercials targeting children or adolescents are usually high in sugar and unhealthy fat, and such are inconsistent with the dietary recommendations. In addition, foods such as biscuits, namkeens (which are rich in trans-fats and saturated fats, salt/ refined carbohydrates) are sold at rock-bottom prices and are positioned as 'entry-level' products in the food market. These foods unfortunately, are much more affordable than the healthy options making the poor vulnerable to chronic diseases. There are chances that adolescents may spend lot of time outside the home, and hence may tend to choose high fat, calorie-dense foods. As adolescents are usually open to new ideas and many preferences developed during period will persist to adulthood, due emphasis should be given in shaping their dietary habits.

Physical activity is seen considerably low in today's children. In a study conducted among 2.3 million school children aged 10-15 years, only 11.5% of girls could finish the recommended health related physical fitness test compared to 16.58% in boys [11]. Earlier, children had more time to play, run about or work out compared to the children of this generation. Due to unsafe roads (traffic, crime) children are discouraged from walking or cycling to school. Motorized vehicles became popular and they are perceived to be quicker and safer for transport. Erosion of open spaces for exercise and lack of parental time to supervise play are all part of new lifestyles. Another important aspect to be taken note is the fact that nowadays schools put more emphasis on good test scores. This takes a toll among children as schools have less focus on physical education. Long school hours, the ordeal of getting ready for school and tuitions are another factors promoting inactivity. Without activity, even the recommended calories lead to a positive energy balance which accumulates as body fat contributing to obesity or metabolic syndrome.

Regular physical activity and exercise can positively impact traditional metabolic and vascular risk factors of coronary artery disease. It improves blood pressure, serum lipids, impaired glucose tolerance and insulin resistance, inflammatory and haemostatic factors, and endothelial function. It reduces overweight and obesity too [12]. The above evidences shows that due importance should be given to improve physical activity and dietary behaviors among adolescents so that active living is sustained throughout the life.

A clear understanding of the existing risk in the population is crucial for appropriate designing and timely (before the initiation of atherosclerosis) implementation of preventive interventions to control the rising tide of non communicable diseases including cardiovascular disease [13]. The aim of this study was thus to assess diet and physical activity patterns among rural school going adolescents residing in Thrissur district, Kerala.

Materials and Methods

Research approach

A quantitative, non experimental approach.

Research design

Cross-sectional, descriptive survey design.

Target Population

Adolescents studying in high schools of Thrissur district, Kerala.

Sample and Sampling technique

A Convenient sampling technique was used to select four high schools of Thrissur district, Kerala. A total of 252 school children were included in the study. Those who belong to the age group of 11-16 years, studying in 7th class and who were willing to participate involved in the study. Adolescents who were diagnosed as having some cardiovascular diseases, chronic illnesses, severe malnutrition, physical and mental defects or not cooperative were excluded from the study.

Setting

The study was conducted Thrissur district, Kerala, South India. Thrissur district is located approximately at the centre of the state with a population of 3121200 persons and a density of 1,026/sqkm^2. This district has a literacy rate higher than the national average. The study was conducted among adolescents studying in the rural schools of Thrissur district and mixed schools were selected to involve the participation of both boys and girls.

Ethical considerations

Permission was obtained from the school authorities and Directorate of Public Instructions. Assent was taken from the school children and a written informed consent was taken from parent teachers association. The study was approved by Institutional ethics committee.

Data collection tools and technique

Data were collected through a structured questionnaire. The questionnaire was developed by the researcher after an extensive literature review and pilot testing. Validity and reliability was established before administration. The first part of the questionnaire included items to obtain information on sociodemographic personal profile of adolescents. Dietary behavior was assessed under two domains; dietary habits and dietary consumption pattern of adolescents as compatible with Kerala culture and norms on diet preferences and consumption pattern. Adolescents were asked to report normal routine diet they had but not in marriages/parties [14].

Physical activity behavior was assessed by using modified version of Physical Activity Questionnaire (PAQ) for adolescents and transport related physical activity was captured by asking a question on mode of commute to school. Though it is freely available and can be modified to the context, permission was obtained to do the same. Once we have a value from 1 to 5 for each of the 6 items used in the physical activity composite score, the mean of these 6 items formed the final physical activity summary score. A score of 1 indicated low physical activity whereas a score of 5 indicated high physical activity. Based on the final score the level of physical activity was classified as adequate (scores ≥ 3) and inadequate (scores <3) for statistical analysis and comparisons.

Validity and reliability

Validity and reliability (r = 0.72) was established before administration.

Data analysis

The collected data were coded, entered in the master sheet. It was decided to analyze the data by descriptive and inferential statistics on the basis of objectives and the hypotheses of the study. The data was analyzed in terms of descriptive (mean, standard deviation, percentage) and inferential statistics (independent t- test, chi-sqaure test/ fishers exact test). A p value of <0.05 was taken as statistically significant.

Results

Description of study participants

The mean age of adolescents was 12.29±0.5 years, majority were boys (68.7%), and residing in rural area (74.6%). Majority of the mothers (61.5%) and fathers (69.0%) of adolescents were educated up to metric. Most of the mothers were homemakers (59.9%) while majority of the fathers were engaged in private job (55.6%). It was found that most of the parents were engaged in higher and intermediate non-manual work; 46% of fathers and 44% of mothers. Out of all 49.6% of adolescents had reported family history of cardiovascular disease. Majority of the adolescents (97.2%) had no prior information regarding CAD while 0.8% each reported health personnel and school curriculum as a source of information.

Dietary behavior among adolescents

Table 1: Gender wise comparison of dietary habits among adolescents

Variable	Category	Girls		Boys		Test value	P value
		f	%	f	%		
Skipping breakfast/meals	Inappropriate	7	8.9	6	3.5	5.149	0.076[ns]
	Moderate	22	27.8	57	38.7		
	Appropriate	50	63.3	100	57.8		
Drinking soft drinks with meals or snacks	Inappropriate	6	7.6	6	3.5	5.751	0.056 [ns]
	Moderate	23	29.1	75	43.4		
	Appropriate	50	63.3	92	53.2		
Eating meals with pappad or pickle	Inappropriate	23	29.1	59	34.1	5.171	5.171 [ns]
	Moderate	46	58.2	76	43.9		
	Appropriate	10	12.7	38	22		
Add extra salt to food/ salad/curd after it is served	Inappropriate	23	29.1	33	19.1	3.164	0.206 [ns]
	Moderate	27	34.2	68	39.3		
	Appropriate	29	36.7	72	41.6		
Add extra butter/oil to chapathi /vegetables after it is served	Inappropriate	5	6.3	24	13.9	3.143	0.208 [ns]
	Moderate	29	36.7	55	31.8		
	Appropriate	45	57	94	54.3		

[ns]-Not significant at 0.05 level, Chi-square /Fishers exact test

Table 2: Gender wise comparison of dietary consumption among adolescents

Variable	Category	Girls		Boys		Test value	P value
		f	%	f	%		
Vegetables	Inappropriate	40	50.6	75	43.4	1.175	0.556 [ns]
	Moderate	18	22.8	44	25.4		
	Appropriate	21	26.6	54	31.2		
Fruits	Inappropriate	30	38	77	44.5	0.948	0.623 [ns]
	Moderate	25	31.6	49	28.3		
	Appropriate	24	30.4	47	27.2		
Milk/milk products	Inappropriate	20	25.3	50	28.9	0.625	0.732 [ns]
	Moderate	16	20.3	38	22		
	Appropriate	43	54.4	85	49.1		
Bakery products	Inappropriate	34	43	81	46.8	1.519	0.468 [ns]
	Moderate	22	27.8	54	31.2		
	Appropriate	23	29.1	38	22		
Fish curry	Inappropriate	8	10.1	25	14.5	2.186	0.335 [ns]
	Moderate	35	44.3	61	35.3		
	Appropriate	36	45.6	87	50.3		
Sweets	Inappropriate	37	46.8	72	41.6	0.655	0.721 [ns]
	Moderate	27	34.2	67	38.7		
	Appropriate	15	19	34	19.7		

Variable	Category	Girls		Boys		Test value	P value
		f	%	f	%		
Fried foods	Inappropriate	31	39.2	53	30.6	1.843	0.398 ns
	Moderate	26	32.9	63	36.4		
	Appropriate	22	27.8	57	32.9		
Hotel	Inappropriate	1	1.3	15	8.7	12.015	0.002**
	Moderate	16	20.3	59	34.1		
	Appropriate	62	78.5	99	57.2		
Fast foods	Inappropriate	13	16.5	25	14.5	2.64	0.267 ns
	Moderate	24	30.4	71	41		
	Appropriate	42	53.2	77	44.5		
Carbonated drinks	Inappropriate	3	3.8	33	19.1	10.992	0.004**
	Moderate	20	25.3	44	25.4		
	Appropriate	56	70.9	96	55.5		

ns-Not significant at 0.05level, ** Significant at 0.01 level, Chi-square /Fishers exact test

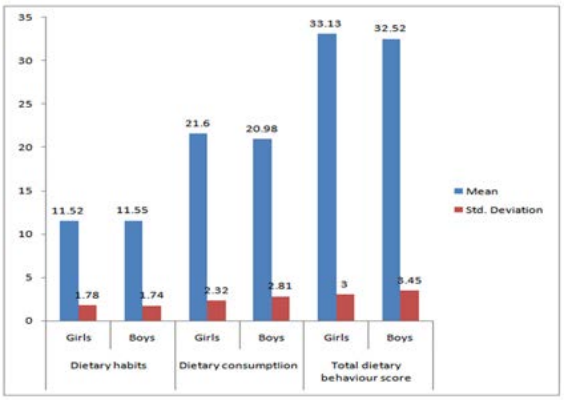

Fig. 1: Mean and standard deviation of dietary behavior score

The mean total dietary behavior score was found to be 32.71±3.32; boys 32.52±3.45, girls 33.13±2.3. There were no statistically significant differences in the mean score of dietary habits (t=0.127, p=0.899), dietary consumption(t=1.757, p=0.080), and total dietary behavior score (t=1.349, p=0.179) between boys and girls at 0.05 level of significance. But inappropriate consumption of carbonated drinks and hotel foods was found to be higher among boys when compared to girl (Table 2) at 0.01 level.

Physical activity/exercise behavior among adolescents

The mean physical activity score was 1.76 ±0.3; boys 1.73±0.28, girls 1.77±0.31. Out of all, none of the boys and girls reported to have adequate levels of physical activity. Among them, 69% of them were actively commuting to school. A statistically significant higher number of boys were actively commuting to school when compared to girls (t=4.915) at 0.05 level. The details of physical activity behavior can be obtained from Table 3.

Table 3: Gender wise comparison of physical activity behaviour among adolescents

Variable	Category	Girls		Boys		Test value	P value
		f	%	f	%		
Physical activity level during physical education classes	Adequate	16	20.3	37	21.4	0.42	0.838
	Inadequate	63	79.7	136	78.6		
Physical activity level during lunch	Adequate	10	12.7	31	17.9	1.102	0.294
	Inadequate	69	87.3	142	82.1		
Physical activity level during weekdays (evening)	Adequate	9	11.4	20	11.6	0.002	0.969
	Inadequate	70	88.6	153	88.4		
Physical activity level during weekends	Adequate	22	27.8	30	17.3	3.656	0.056
	Inadequate	57	72.2	143	82.7		
Physical activity level during last 7 days	Adequate	13	16.5	22	12.7	0.634	0.426
	Inadequate	66	83.5	151	87.3		

Discussion

The unhealthy dietary behavior revealed in the present study findings have been supported by studies conducted by Rao KM et al. [15], Srivasthava A et al. [16], and Kotecha PV et al. [17] In a large prospective population study, there was a clear revelation of increasing CAD risk with consumption of meat [18]. Rastogi T et al. revealed an inverse association between CAD risk and consumption of vegetables specifically green leafy vegetables and use of mustard oil compared to sunflower or other oils among Indians [19]. A high intake of saturated fat, trans fatty acids, and hydrogenated vegetable oils may contribute to elevated serum cholesterol and CAD mortality [20,21]. Kuriyan R et al. found a relationship between increased consumption of bakery items, nonvegetarian foods, eating while watching television, snacking between meals, family meals, skipping breakfast, and waist circumference among South Indian children [22]. Chambers JC et al. had also found that low intakes of vitamin B-6 and folate as a contributory element for high CAD in India [23]. Meta-analyses by He FJ et al have found a 4% lower risk of CAD with each daily serving of fruits or vegetables [24] and Dauchet L et al recommended five or more daily servings of fruits and vegetables for optimal nutrition [25].

It is commonly believed that South Asians are mostly vegetarians and consume large quantity of fruits and vegetables. But the INTERHEART data revealed a low daily fruit and vegetable intake among South Asian population compared to the rest of the world. The meal pattern was often high in grains, ghee, fried foods, and processed foods. Many of these are high in carbohydrates, transfatty acids, and saturated fat. In addition, the habit of overcooking vegetables reduced the content of protective micronutrients compared with raw or properly cooked vegetables [26]. There are frequent consumption of meals at fast-food outlets [27] and oversized portions at home and at restaurants [28]. These foods are often high in calorie, fat, and low in fibre [29]. An increased tendency towards consumption of sweetened beverages is also commonly seen [30]. Evidences suggest that physical activity in Indian adolescents has diminished in the last few decades. According to Roy S et al. [31], Kaur SS et al.[32], Bachani D et al. [33], Ramya KR [14] and Jagdish et al. [34] the current generation of adolescents are spending less time being physically active.

Conclusion

In conclusion, the findings from this study suggest that the dietary and physical activity behaviour among adolescents is largely inappropriate. These observations give a cause for concern in relation to their current and future risk of non communicable diseases including cardiovascular diseases, and diabetes. So Strategies need to be adopted to improve young youths' nutritional status, such as improving their dietary knowledge, improving their dietary intake, promoting healthy eating habits and establishing a healthy lifestyle via an increase of physical activity.

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Original Article

Indian Journal of Hospital Administration
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Effect of Hospital Accreditation on Quality of Care as Perceived by Patients

Arif Raza[1]

Abstract

The study is aimed at understanding whether the accreditation of hospital in India (NABH) has any effect on its quality, as perceived by the patients. Primary data was collected from patients who took treatment in accredited and non-accredited hospitals, on their rating of Infrastructure, process and outcome of care at their hospital. The data was statistically analysed to determine if there is any significant difference in the rating given by accredited hospital's patients from non-accredited hospital's patients.

The study found that except infrastructure component, the mean rating and percentage of high rating were significantly higher for process and outcome component. The overall rating was also significantly higher by accredited hospitals patients.

Keywords: Accreditation; Hospital; Healthcare Quality; Patient Care.

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Introduction

Accreditation of hospitals is considered as one of the most successful mechanism to achieve improvement in quality and safety of healthcare [1]. Accreditation is the recognition of a certain level of quality by an organization as assessed by a third party. It is a process of certifying the credibility of an organization. In healthcare, accreditation recognize and certifies the capability of a healthcare organization in delivering an acceptable standard of healthcare services, which is based upon good and safe practices.

Accreditation is gaining prominence amongst healthcare organizations in India [2]. Accreditation by National Accreditation Board for Hospitals and Healthcare Providers (NABH) is the most sought after accreditation by Indian hospitals. After the advent of NABH accreditation in India in 2006, the number of hospital achieving NABH accreditation has been consistently increasing [2]. The process of getting accreditation by NABH involves application, pre-assessment, final assessment and grant of accreditation. In between these stages the HCO is required to prepare itself as per the requirements of accreditation standards [3,4].

Since its inception the NABH board has promoted accreditation of hospital as an effective mean to improve quality and patient safety [5,6]. Several benefits of accreditation for different stakeholders of the hospital have been mentioned [5,6]. Several other organizations specifically who are in business of providing consultancy support to hospitals also promotes accreditation on similar lines [7].

However, the recognition of accreditation as a means to healthcare quality have not been sufficiently verified scientifically [7]. Although there have been various researches and systematic literature reviews conducted in other parts of the world, in India no such study has been done till date. The concept of accreditation in hospitals started almost 60-70 years back and in last two decades have gained high momentum, the quantum of researches done on accreditation is relatively limited [5]. Due to the growing need of

accreditation in healthcare and amount of efforts involved in it, questions are being raised on value that accreditation brings in to healthcare quality. Several studies conducted on few prominent accreditation systems to see its effect on healthcare and since these accreditation system differs in their structure, system and implementation mechanism, the results of these studies are expected to be varying.

Effect of accreditation has been researched by several researchers using different methods. These studies have been done on different accreditation system in world and hence there is a limitation with generalizing their finding on other accreditation systems. While most studies found evidence of accreditation having a positive impact on healthcare outcomes, the level and consistency of effect have not been sufficiently verified. Also these studies have majorly shown that different component of a healthcare organization had different level of impact on its quality.

Existing studies on healthcare accreditation shows differential result with different accreditation system. Also, as different accreditation system has their own set of standards, assessment and accreditation method, generalizing result of study of on one accreditation system on other may be limited. Several studies have also found contradicting findings even with same accreditation system. This explains that while accreditation may have sufficient association on some parameters it may not be associated with other parameters.

While most studies observed and compared accreditation's impact on clinical care components [8-14], very few shows an overall impact on hospital as an organization [15,16,17]. Clinical care although is a vital component of healthcare the non-clinical aspects also plays an important role in overall healthcare quality. Things like infrastructure, human resource capability, patient care processes, client satisfaction etc. constitutes and important part of overall quality and whether or not accreditation has any effect on them, is not reflecting from literatures reviewed.

With regards to NABH accreditation no significant literature could be found on studies relating accreditation with quality, patient safety or healthcare outcome. In one intra-institutional experience study that was conducted to evaluate the change of attitude toward acceptance of NABH guidelines by medical practitioner, it was reported that medical staff had a positive attitude and improved knowledge about accreditation after 6 months working in a hospital on the way to NABH [22]. However, no link with healthcare performance, quality, safety or outcome were made. Hence there is a need to study how NABH is associated with healthcare delivery and what is its effects/impacts on healthcare outcome, quality and safety.

Accreditation requires significant amount of financial resources and efforts on part of the hospitals. Financial implications for accreditation are both direct and indirect [4]. Direct costs are those in form of accreditation fee and cost involved in process of accreditation such as external assessments. These costs are recurring in nature. Indirect costs are those that are required to be done in hospital in-order to comply with accreditation requirements. These costs are variable and to large extent depend upon existing status of the hospital and how much work is involved in meeting accreditation requirements. Although there is no authentic data explaining expenditure on accreditation, it can range from moderate to high.

Since these expenditure and efforts are being done primarily to improve patient care quality [6], it is imperative to have an evidence to ascertain the same. One of the most important stakeholder for hospitals are its patient and hence it is imperative to know, if there is a difference in the way patients' perceive accredited and non-accredited hospitals.

Methodology

The methodology aimed at understanding whether or not hospital accreditation affects the quality of healthcare, as perceived by the Patients. For this, response of patients, who took treatment in accredited and non-accredited hospitals were collected through a standard instrument created for the purpose of this study.

Framework of the study: Since the concept of quality in healthcare has been explained in numerous ways and there are different models available for its description, identifying one for the purpose for this research is essential to avoid confusion and to bring in uniformity in measuring and stating quality. There are significantly large number of different models in healthcare for quality which indicates that modelling the healthcare quality correctly is near impossible or it is a fiction not a reality [25]. After reviewing the popular models [19-23], Donabedian's conceptual model of quality of care has been chosen for this study.

The model proposed by AvedisDonabedian is arguably the most widely accepted method to design the main dimensions of healthcare quality [24,25,26]. In his work published in 1988, Donabedian defined the quality and described its parameters in healthcare organization. According to the model, understanding about quality of care can be drawn from three categories: "structure," "process," and "outcomes.". Structure describes the context in which care is delivered, including hospital buildings, staff, financing, and equipment. Process denotes the transactions between patients and providers throughout the delivery of healthcare. Finally, outcomes refer to the effects of healthcare on the health status of patients and populations.

The study utilizes Donabedian's quality of care model to describe and assess quality in healthcare organization. The instruments used for data collection are constructed based on components described under this model. The concept of quality in healthcare given in this model has been adopted for analysis, discussion and findings in this study.

Accordingly, the response of quality of healthcare were collected and analysed under following components-

1. Infrastructure of hospital – This includes facility, equipment and human resources of the hospital, as perceived by patients
2. Process – This includes policies and processes used at hospital for clinical and non-clinical work, as perceived by patients
3. Outcome – The outcome of treatment, as perceived by the patient
4. Overall – This is the overall response on quality of the hospital by the patient

Study design: Cross sectional exploratory study design is used for the purpose of this research work. The data from sample belonging to accredited hospitals was compared with the data from sample belonging to non-accredited hospitals. The samples were matched in all other parameters except their belonging to accredited or non-accredited hospital. The data from 2 samples were analysed to observe of significant differences.

Study group (respondent patients): The respondents were sourced from 2 hospitals who are accredited by NABH and 2 hospitals that were not accredited at the time of collection of data. The comparison of hospitals from where respondents were sampled is given in table 1 below.

Table 1: Hospitals from where respondents were sampled

	Hospital A	**Hospital B**	**Hospital C**	**Hospital D**
Accreditation status	Accredited by NABH	Accredited by NABH	Not accredited	Not Accredited
Date of achieving accreditation	23 June, 2013	27 September, 2016	NA	NA
Ownership	Private – Corporate	Private – Corporate	Private – Corporate	Private – Corporate
Bed strength	150	175	150	120
Facilities	OPD, IPD, ICU, Surgical services and Emergency services	OPD, IPD, ICU, Surgical services and Emergency services	OPD, IPD, ICU, Surgical services and Emergency services	OPD, IPD, ICU, Surgical services and Emergency services
Average annual out-patient attendance	40,000 – 45,000	65,000 – 75,000	55,000 – 60,000	45,000 – 50,000
Average annual in-patient admissions	3,800 – 4,100	6,800 – 7,000	5,000 – 5,200	4,00 – 4,300
Average Bed occupancy rate	45-50%	55-60%	50-55%	50-55%

The patients who took treatment in any one of the above hospitals were randomly sampled using the criteria given in Table 2 below.

Table 2: Inclusion and Exclusion Criteria

Respondent group	**Inclusion criteria**	**Exclusion criteria**
Patient from accredited hospital	• Patients who took treatment in an NABH accredited hospital (selected hospitals for the purpose of this study) • Patient has spent at-least 2 days in the hospital • Patient has been discharged from the hospital	• Age less than 18 • Have not taken any treatment in the hospital • Discharged from the hospital more than 1 month before the day on which response is being sought • Not in a sound mind to give response

Respondent group	Inclusion criteria	Exclusion criteria
Patient from non-accredited hospital	• Patients who took treatment in a hospital not accredited by any national or international body (selected hospitals for the purpose of this study) • Patient has spent at-least 2 days in the hospital • Patient has been discharged from the hospital	• Age less than 18 • Have not taken any treatment in the hospital • Discharged from the hospital more than 1 month before the day on which response is being sought • Not in a sound mind to give response

Data collection: Data was collected using the structured instrument created on the basis of Donabedian's concept of quality in healthcare. The validity analysis of the instrument and pilot testing was carried out prior to collection of actual data. The instrument was prepared in two languages, English and Hindi.

Hypothesis: The hypothesis which were used for statistical analysis are

H0-1: There is no significant difference in the rating given to **infrastructure** component of the hospital, by Patients' from accredited hospital (Pat-Ac) and Patients from non-accredited hospitals (Pat-NAc)

H0-2: There is no significant difference in the distribution of 'high' and 'not high' rating given to **infrastructure** component, by Pat-Ac and Pat-NAc

H0-3: There is no significant difference in the rating given to **process** component of the hospital, by Pat-Ac and Pat-NAc

H0-4: There is no significant difference in the distribution of 'high' and 'not high' rating given to **process** component, by Pat-Ac and Pat-NAc

H05: There is no significant difference in the rating given to **outcome** component of the hospital, by Pat-Ac and Pat-NAc

H06: There is no significant difference in the distribution of 'high' and 'not high' rating given to **outcome** component, by Pat-Ac and Pat-NAc

H07: There is no significant difference in the rating given to **overall** hospital, by Pat-Ac and Pat-NAc

H08: There is no significant difference in the distribution of 'high' and 'not high' rating given to **overall** hospital**;**, by Pat-Ac and Pat-NAc

Findings

A total of 295 patients were sampled for the study, 144 from accredited hospitals and 151 from non-accredited hospitals. The profile mix of patients under both the group is described in table 3 below.

Table 3: Patients' sample mix

Description	From accredited hospitals	From non-accredited hospitals	Total
Sample size (n)	144	151	295
Gender			
Males	93 (64.58%)	99 (65.56%)	144 (48.81%)
Females	51 (35.42%)	52 (34.44%)	151 (51.19%)
Age group			
18-30	17 (11.81%)	26 (17.22%)	43 (14.58%)
31 – 45	45 (31.25%)	49 (32.45%)	94 (31.86%)
46 - 60	49 (34.03%)	49 (32.45%)	98 (33.22%)
> 60	33 (22.92%)	27 (17.88%)	60 (20.34%)
Educational level			
Class 10 or below	14 (9.72%)	27 (17.88%)	41 (13.90%)
Class 12 / Diploma holders	37 (25.69%)	54 (35.76%)	91 (30.85%)
Graduation and above	93 (64.58%)	70 (46.36%)	163 (55.25%)
Income level			
Low income group	19 (13.19%)	30 (19.87%)	49 (16.61%)
Middle income group	112 (77.78%)	114 (75.5%)	226 (76.61%)
High income group	13 (9.03%)	7 (4.64%)	20 (6.78%)
Regularity with hospital			
First time	112 (77.78%)	94 (62.25%)	206 (69.83%)
Re-visiting	32 (22.22%)	57 (37.75%)	89 (30.17%)
Length of stay			
2 – 5 days	62 (43.06%)	61 (40.4%)	123 (41.69%)
6 – 10 days	58 (40.28%)	57 (37.75%)	115 (38.98%)
> 10 days	24 (16.67%)	33 (21.85%)	57 (19.32%)
Payment of bills			
Self/Family	97 (67.36%)	109 (72.19%)	206 (69.83%)
Insurance	36 (25%)	19 (12.58%)	55 (18.64%)
Company/ Employer	8 (5.56%)	17 (11.26%)	25 (8.47%)
Other	3 (2.08%)	6 (3.97%)	9 (3.05%)

The summary of data from patients on Infrastructure component is given in Table 4 below

Table 4: Summary of data from patients on Infrastructure component

	Pat-Ac	Pat-NAc
Sample size (n)	144	151
Mean rating	4.24	4.25
Standard Deviation	1.23	0.9
No. of rating as		
5	80 (55.56%)	78 (51.66%)
4	39 (27.08%)	45 (29.8%)
3	12 (8.33%)	20 (13.25%)
2	5 (3.47%)	5 (3.31%)
1	8 (5.56%)	3 (1.99%)

Testing of null Hypothesis H0-1a: To test the null hypothesis (There is no significant difference in the rating given to **infrastructure** component of the hospital, by Pat-Ac and Pat-NAc), t-test (two sample assuming unequal variances) was performed, using data analysis tool in Microsoft Excel. Result of the test is given in the table 5 below.

Table 5: t-Test: Two-Sample Assuming Unequal Variances: Data: Patients rating on Infrastructure component

	Pat-Ac	Pat-Nac
Mean	4.236111	4.258278
Variance	1.230575	0.899514
Observations	144	151
Hypothesized Mean Difference	0	
Df	281	
t Stat	-0.18407	
P(T<=t) one-tail	0.427046	
t Critical one-tail	1.650294	
P(T<=t) two-tail	0.854091	
t Critical two-tail	1.968442	

As the P value (P(T<=t) two-tail = 0.854091) is not less than alpha (??= 0.05), result is **not significant** and null hypothesis (H0-1a) **can not be rejected**.

Testing of Hypothesis H0-1b: To test the null hypothesis (There is no significant difference in the distribution of 'high' and 'not high' rating given to **infrastructure** component, by Pat-Ac and Pat-NAc), a Chi square, test for independence was performed. Result of the test is givenin table 6 below.

* Rating of 4 and 5 is taken as 'high' rating and rating below 4 as 'not high' rating.

Table 6: Cross tab of rating on infrastructure components by patients and accreditation status of hospital

			Rating		Total
			High	Not High	
Accreditation_status	Accredited	Count	119	25	144
		Expected Count	118.1	25.9	144.0
		% within Accreditation_status	82.6%	17.4%	100.0%
	Not Accredited	Count	123	28	151
		Expected Count	123.9	27.1	151.0
		% within Accreditation_status	81.5%	18.5%	100.0%
Total		Count	242	53	295
		Expected Count	242.0	53.0	295.0
		% within Accreditation status	82.0%	18.0%	100.0%

Table 7: Chi-Square Tests Values

	Value	df	Asymp. Sig. (2-sided)	Exact Sig. (2-sided)	Exact Sig. (1-sided)
Pearson Chi-Square	.070[a]	1	.792		
Continuity Correction[b]	.013	1	.910		
Likelihood Ratio	.070	1	.791		
Fisher's Exact Test				.880	.456
N of Valid Cases	295				

a. 0 cells (0.0%) have expected count less than 5. The minimum expected count is 25.87.
b. Computed only for a 2x2 table

As the Chi-square value is 0.070 and corresponding P value is 0.792, the result is **not significant** at $p < 0.05$. Hence, null hypothesis – H0-1b **can not be rejected**.

Analysis of data on process component: The summary of data from patients on process component is given in table 8 below.

Table 8: Summary of data from patients on Infrastructure component

	Pat-Ac	Pat-NAc
Sample size (n)	144	151
Mean rating	3.89	3.57
Standard Deviation	1.44	2.05
No. of rating as		
5	57 (39.6%)	56 (37.09%)
4	43 (29.9%)	30 (19.87%)
3	25 (17.4%)	32 (21.19%)
2	9 (6.3%)	10 (6.62%)
1	10 (6.9%)	23 (15.23%)

Testing of null Hypothesis H0-1c: To test the null hypothesis (There is no significant difference in the rating given to **process** component of the hospital, by Pat-Ac and Pat-NAc) t-test (two sample assuming unequal variances) was performed, using data analysis tool in Microsoft Excel. Result of the test is given in the table 9.

Table 9: t-Test: Two-Sample Assuming Unequal Variances: Data: Patients rating on Process component

	Pat-Ac	**Pat-Nac**
Mean	3.888889	3.569536
Variance	1.442113	2.046799
Observations	144	151
Hypothesized Mean Difference	0	
Df	288	
t Stat	2.080146	
P(T<=t) one-tail	0.019198	
t Critical one-tail	1.650162	
P(T<=t) two-tail	0.038396	
t Critical two-tail	1.968235	

As the P value (P(T<=t) two-tail = 0.038396) is less than alpha (??= 0.05), result is **significant** and null hypothesis (H0-1a) is **rejected**.

Testing of Hypothesis H0-1d: To test the null hypothesis (There is no significant difference in the distribution of 'high' and 'not high' rating given to **process** component, by Pat-Ac and Pat-NAc), a Chi square, test for independence was performed. Result of the test is given in table 10 below.

* Rating of 4 and 5 is taken as 'high' rating and rating below 4 as 'not high' rating.

Table 10: Cross tab of rating on process components by patients and accreditation status of hospital

			Rating		Total
			High	Not High	
Accreditation_status	Accredited	Count	100	44	144
		Expected Count	90.8	53.2	144.0
		% within Accreditation_status	69.4%	30.6%	100.0%
	Not Accredited	Count	86	65	151
		Expected Count	95.2	55.8	151.0
		% within Accreditation_status	57.0%	43.0%	100.0%
Total		Count	186	109	295
		Expected Count	186.0	109.0	295.0
		% within Accreditation_status	63.1%	36.9%	100.0%

Table 11: Chi-Square Tests Values

	Value	**df**	**Asymp. Sig. (2-sided)**	**Exact Sig. (2-sided)**	**Exact Sig. (1-sided)**
Pearson Chi-Square	4.936[a]	1	.026		
Continuity Correction[b]	4.415	1	.036		
Likelihood Ratio	4.960	1	.026		
Fisher's Exact Test				.030	.018
N of Valid Cases	295				

a. 0 cells (0.0%) have expected count less than 5. The minimum expected count is 53.21.
b. Computed only for a 2x2 table

As the Chi-square value is 4.936 and corresponding P value is 0.026, the result is **significant** at $p < 0.05$. Hence, null hypothesis – H0-1d is **rejected**.

Analysis of data on outcome component: The summary of data from patients on outcome component is given in table 12 below

Table 12: Summary of data from patients on Infrastructure component

	Pat-Ac	Pat-NAc
Sample size (n)	144	151
Mean rating	4.24	3.84
Standard Deviation	1.36	1.53
No. of rating as		
5	86 (59.7%)	58 (38.41%)
4	31 (21.5%)	38 (25.17%)
3	12 (8.3%)	30 (19.87%)
2	6 (4.2%)	14 (9.27%)
1	9 (6.3%)	11 (7.28%)

Testing of null Hypothesis H0-1e: To test the null hypothesis (There is no significant difference in the rating given to **outcome** component of the hospital, by Pat-Ac and Pat-NAc) t-test (two sample assuming unequal variances) was performed, using data analysis tool in Microsoft Excel. Result of the test is given in the table 13.

Table 13: t-Test: Two-Sample Assuming Unequal Variances: Data: Patients rating on Outcome component

	Pat-Ac	Pat-Nac
Mean	4.243056	3.84106
Variance	1.360091	1.53457
Observations	144	151
Hypothesized Mean Difference	0	
Df	293	
t Stat	2.870829	
P(T<=t) one-tail	0.002196	
t Critical one-tail	1.650071	
P(T<=t) two-tail	0.004392	
t Critical two-tail	1.968093	

As the P value (P(T<=t) two-tail = 0.004392) is less than alpha (??= 0.05), result is **significant** and null hypothesis (H0-1a) is **rejected**.

Testing of Hypothesis H0-1f: To test the null hypothesis (There is no significant difference in the distribution of 'high' and 'not high' rating given to **outcome** component, by Pat-Ac and Pat-NAc), a Chi square, test for independence was performed. Result of the test is given in table 14 below. *Rating of 4 and 5 is taken as 'high' rating and rating below 4 as 'not high' rating.

Table 14: Cross tab of rating on process components by patients and accreditation status of hospital

			Rating		Total
			High	Not High	
Accreditation_status	Accredited	Count	117	27	144
		Expected Count	104.0	40.0	144.0
		% within Accreditation_status	81.3%	18.8%	100.0%
	Not Accredited	Count	96	55	151
		Expected Count	109.0	42.0	151.0
		% within Accreditation_status	63.6%	36.4%	100.0%
Total		Count	213	82	295
		Expected Count	213.0	82.0	295.0
		% within Accreditation_status	72.2%	27.8%	100.0%

Table 15: Chi-Square Tests Values

	Value	df	Asymp. Sig. (2-sided)	Exact Sig. (2-sided)	Exact Sig. (1-sided)
Pearson Chi-Square	11.472[a]	1	.001		
Continuity Correction[b]	10.608	1	.001		
Likelihood Ratio	11.664	1	.001		
Fisher's Exact Test				.001	.001
N of Valid Cases	295				

a. 0 cells (0.0%) have expected count less than 5. The minimum expected count is 40.03.
b. Computed only for a 2x2 table

As the Chi-square value is 11.472 and corresponding P value is 0.001, the result is **significant** at $p < 0.05$. Hence, null hypothesis – H0-1f is **rejected**.

Analysis of data on overall hospital rating: The summary of data from patients on overall hospital rating is given Table 16 below

Table 16: Summary of data from patients on Infrastructure component

	Pat-Ac	Pat-NAc
Sample size (n)	144	151
Mean rating	4.20	3.85
Standard Deviation	1.41	1.61
No. of rating as		
5	84 (58.3%)	63 (41.72%)
4	28 (19.4%)	32 (21.19%)
3	17 (11.8%)	30 (19.87%)
2	7 (4.9%)	14 (9.27%)
1	8 (5.6%)	12 (7.95%)

Testing of null Hypothesis H0-1g: To test the null hypothesis (There is no significant difference in the rating given to **overall** hospital, by Pat-Ac and Pat-NAc) t-test (two sample assuming unequal variances) was performed, using data analysis tool in Microsoft Excel. Result of the test is given in the table 17.

Table 17: t-Test: Two-Sample Assuming Unequal Variances: Data: Patients' overall rating for hospital

	Pat-Ac	Pat-Nac
Mean	4.201389	3.854305
Variance	1.406711	1.618631
Observations	144	151
Hypothesized Mean Difference	0	
Df	293	
t Stat	2.424837	
P(T<=t) one-tail	0.00796	
t Critical one-tail	1.650071	
P(T<=t) two-tail	0.01592	
t Critical two-tail	1.968093	

As the P value (P(T<=t) two-tail = 0.01592) is less than alpha (??= 0.05), result is **significant** and null hypothesis (H0-1g) is **rejected**.

Testing of Hypothesis H0-1h: To test the null hypothesis (There is no significant difference in the distribution of 'high' and 'not high' rating given to **overall** hospital**;** by Pat-Ac and Pat-NAc), a Chi square, test for independence was performed. Result of the test is given in Table 18 below.

* Rating of 4 and 5 is taken as 'high' rating and rating below 4 as 'not high' rating.

Table 18: Cross tab of overall rating for hospitals given by patients and accreditation status of hospital

			Rating		Total
			High	Not High	
Accreditation_status	Accredited	Count	112	32	144
		Expected Count	101.0	43.0	144.0
		% within Accreditation_status	77.8%	22.2%	100.0%
	Not Accredited	Count	95	56	151
		Expected Count	106.0	45.0	151.0
		% within Accreditation_status	62.9%	37.1%	100.0%
Total		Count	207	88	295
		Expected Count	207.0	88.0	295.0
		% within Accreditation status	70.2%	29.8%	100.0%

Table 19: Chi-Square Tests Values

	Value	df	Asymp. Sig. (2-sided)	Exact Sig. (2-sided)	Exact Sig. (1-sided)
Pearson Chi-Square	7.780[a]	1	.005		
Continuity Correction[b]	7.086	1	.008		
Likelihood Ratio	7.861	1	.005		
Fisher's Exact Test				.007	.004
No of Valid Cases	295				

a. 0 cells (0.0%) have expected count less than 5. The minimum expected count is 40.03.
b. Computed only for a 2x2 table

As the Chi-square value is 7.780 and corresponding P value is 0.005, the result is **significant** at $p < 0.05$. Hence, null hypothesis – H0-1h is **rejected**.

Conclusion

- The data and its analysis shows following result the mean rating given to infrastructure component by patients of accredited hospital do not significantly differ from the mean rating given by patients of non-accredited hospital. The distribution of high and not high rating also do not differ between patients of accredited and non-accredited hospital
- The analysis of process component of hospital, shows significant difference in ratings given by patients of accredited and non-accredited hospital
- Differences in mean rating of outcome by respondents from accredited and by respondents from non-accredited hospitals was also found to be statistically significant, with rating by respondents from accredited group being significantly higher
- The analysis of overall rating has shown significant difference in ratings by respondents from accredited and non-accredited hospital in both the categories. The distribution of 'high' rating was also found to be higher in accredited group respondents

Thus, it could be concluded that except for infrastructure, the other components of quality, i.e. process and outcome, has been perceived better by patients from accredited hospital in comparison to non-accredited hospitals. The overall response on hospital was also better for accredited hospitals.

Recommendation

While the accreditation system do seem to improve process and outcomes in view of patients and healthcare providers, the infrastructure component is not effected. As infrastructure is also a basic component of quality of care, the accreditation system must focus more on improving this component of the hospital.

Limitation

The study has some limitations which should be taken into consideration while interpreting the results

- The effect on quality has been measured by the rating given by patients. This may differ from the technical data on infrastructure, process and outcome.
- The study is based on a cross sectional data and do not features in time series data. Hence study cannot comment upon whether the data collected at the time of collection holds true across the time.

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Original Article

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Determination of the Patient Safety Culture Among Nurses Working in a Tertiary Care Hospital South India

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Abstract

Patient safety is one of the most important and essential elements of quality in healthcare setting. A report by the Medial Council of India indicates that almost 5.2 million injuries happen every year due to medical errors and adverse events. Recent evidences suggest that majority of these errors and harm associated can be prevented by creating a culture of patient safety. The aim of the present study was to determine patient safety culture among nurses workingin a tertiary hospital, South India. Using a descriptive cross sectional survey design, 252 nurses were asked to complete hospital survey on patient safety culture (Response rate -84%). Analysis revealed that majority (92.8%) were working for less than 5 years in the current hospital and more than half of them (59.5%) had total professional experience between 1-5years. Safety dimensions with more than 50% positivity were identified and these were;organizational learning, teamwork within units, and feedback & communication about error with the following percentages of positivity 86.5%, 80.95 %and 58.73% respectively. The dimensions with less than 25% positivity were non-punitive response to errors (13.63) and communication openness (21.83). The study recommends focusing on building leadership capacity that support open communication, blame free environment,and interdepartmental collaboration to nurture patient safety culture in hospitals.

Keywords: Medical errors, Harm, Adverse events, Patient safety culture.

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Introduction

Patient safety is evolving as one of the most important and essential elements of quality in healthcare setting. For every patient, carer, family member, and healthcare professionalsafety is pivotal to diagnosis, treatment, and care. Also,patients and their family are entitled to expect to be treated by competent professionals who are appropriately skilled and up-to-date with developments in their field, and in facilities that are fit for purpose.

Worldwide, it is estimated that 1 in every 300 patients experiences harm while getting health care. In the developed countries, the number of patients harmed during hospitalization is estimated to be one in ten patients (World Health Organization 2012). A report by the Medial Council of India indicates that almost 5.2 million injuries happen every year due to medical errors adverse events. This harm is caused by a range of medical errors or adverse events. When the medical errors take place, they lead to increased length of stay in hospitals, litigation associated costs, healthcare-associated infections, lost income, disability, and additional healthcare expenses [1].

Recent evidences suggests that majority of these errors and harm associated can be prevented by creating a culture of patient safety [2]. Patient safety culture is a subset of organizational culture and is defined as the integration of safety thinking and practices into clinical activities. According to the Agency for Healthcare Research and Quality (AHRQ) the safety culture of an organization is the

product of individual and group values, attitudes, perceptions, competencies, and patterns of behavior that determine the commitment to, and the style and proficiency of, an organization's health and safety management. Organizations with a positive safety culture are characterized by communications founded on mutual trust, by shared perceptions of the importance of safety, and by confidence in the efficacy of preventive measures. The culture of safety has 6 dimensions; an organizational commitment towards safety concerns, the acknowledgment of high-risk - error-prone nature of an organization's activities, an emphasis on teamwork and effective communication, honesty, respect and an organizational commitment towards systems analysis and redesign to improve safety. The challenge for health care organizations is not just in defining culture, but in embracing the concepts; it is in embedding safety culture into the every day work of the organization. A patient safety culture will develop open communication with patients, and ensure learning throughout the system when things go wrong. This will bring down the number of adverse events and mistakes i.e. these organizations can carry out most risky procedures with very low hazard rate.

Healthcare is becoming more and more complex day by day, the potential for errors are also becoming high. Creating a culture of safety requires a change in the values and beliefs historically held by healthcare practitioners. Additionally, standardized methods do not exist that outline how a culture of safety can be established in healthcare. Unfortunately, recent studies have demonstrated that cultural change can be initiated in healthcare settings.

Evidence suggests it is necessary to fully understand the safety culture of an organization before designing interventions to improvepatient safety. Measuring and monitoring the patient safety culture in healthcare organizations allows detecting vulnerabilities and implementing and evaluating improvement interventions to strengthen it. Also, measurement promotes transparency; it allows us to benchmark how we are performing relative to others. Measuring safety culture will provide a stimulus to acknowledge significance of creating or improving an organizational safety culture among hospital leadership.

Nurses are the largest workforce in healthcare. In all hospitals, nurses play a vital role in ensuring patient safety due to the nature of their work, which involves ongoing patient monitoring and coordination of care [3]. This also provides them with various opportunities to reduce adverse events and to intercept healthcare errors before they happen (Institute of Medicine 2004). For this reason, it is of great significance for the nurses to adopt, defend, and have a critical perspective on the issue of patient safety to offer a prolonged and safe care.

There is very limited literature available about the safety culture in Indian hospitals. So the present study was undertaken with an aim to assess safety culture in a tertiary care hospital to raise the awareness of patient safety environment and issues, to facilitate and guide the implementation of interventions in improving patient safety and outcomes.

Methodology

Purpose: Determine the perception of the safety culture among nurses working in a tertiary care hospital.

Research approach: Quantitative approach.

Research design: Cross sectional descriptive survey.

Setting: A tertiary care hospital, Kerala, South India.

Sampling and Data Collection: Convenient sampling technique was used to select sample. The study populations were the nurses who had been working there at least for three month (within the unit as well as in the hospital) and who were available during the period of data collection. HSOPSC (Hospital Survey on Patient Safety Culture) questionnaire, which was developed the AHRQ to measure the patient safety culture in organizations, was used as guide line. Permission was obtained to use the tool before administration. It was designed to measure 12 factors (dimensions) of patient safety culture. The HSOPSC questionnaire contains 42 items which mostly use the 5-point likert response scale of agreement ("Strongly disagree" to "Strongly agree") or frequency ("Never" to "Always"). The survey measures:

Seven unit-level aspects of safety culture

- Supervisor/manager expectations and actions promoting safety (4 items)
- Organizational learning-continuous improvement (3 items)
- Teamwork within units (4 items)
- Communication openness (3 items)
- Feedback and communication about error (3 items)

- Nonpunitive response to error (3 items)
- Staffing (4 items)

Three hospital-level aspects of safety culture

- Hospital management support for patient safety (3 items)
- Teamwork across hospital units (4 items)
- Hospital handoffs and transitions (4 items)

Two outcome variables

- Overall perceptions of safety (4 items)
- Frequency of event reporting (3 items)

Validity and reliability of the questionnaire was ensured before administering. Permission was obtained from the authorities to conduct the study in selected hospital. A pilot study was conducted among 30 nurses to know the feasibility and practicality. This study was conducted during the period starting from October 2017 toDecember 2017. After screening using inclusion and exclusion criteria, a convenient sample of 300 staff nurses from different inpatient departments at the selected hospital was recruited. The researchers initially introduced themselves to all participants and then they clarified the purpose of the study. Confidentiality of the information was assured and anonymity was maintained. Informed written consent was obtained from all the study participants. The response rate of the questionnaire was found to be 84percentage.

Data Analysis

The data was coded and entered to Excel and then converted to SPSS for further analysis. Descriptive statistics of the demographic characteristics of participants and, the average percentage of positive responses on the patient safety culture were computed. Calculation of the composite frequencies for the safety dimensions measured by HSOPSC data collection tool was performed according to the user's guidelines published by the AHRQ.[4] The average percentage of positive responses, defined as the average of the item-level percent positive responses within an HSOPSC dimension, represented positive reaction(s) toward the patient safety culture.

Characteristics of Participants

A total of 252 nurses participated in the survey. The majority (92.8%) were working for less than 5 years in the current hospital. Out of all, experience in respective units was less than one year (27.2%), one to five years period (66.7%) and more than five (0.6%). More than half of them (59.5%) had total professional experience between 1-5years.

Unit level aspects of patient safety culture

Response to the unit level aspects of patient safety culture dimensions is shown in table 1.Items 1-5, 7 and 8 of table 4 shows the composite scores of positivity towards unit level aspects of patient safety culture.When compared to other dimensions, the current study revealed team work within unit as the most powerful dimensionwith a composite score of 80.95 percentage. This means that people like to actively perform and cooperate with their close peers in the same unit. Regarding staffing only, 3.6% reported positive response being working in "crisis mode" and also only 67.9% indicated that they have enough staff to handle the workload. 66.7% reported that they work longer hours than is the best for patient care. Similar findings have been reported by Ghobashi MM et al. They found that only 24% gave positive response being working in ''crisis mode'' and also only 26% gave positive response as regard working longer hours than is best for patient care.[5]This is important because Alahmadi; El-Jardali et al have reported that shortage of nursing staff leads to an increase in workload, and this pressure is considered a majorcause of errors [6].

Out of all, 77.4% of participants reported that their supervisor/manager overlooks patient safety problems that happen over and over in their unit and 45.2% had negative response regarding supervisor's instructions whenever pressure appears at work. This is in agreement with the findings of Ghobashi MM et al. [5] as only 30% of the interviewed staff had positive response regarding supervisor's instructions whenever pressure appears at work [5].

The main area of strength revealed in the current study is organizational learning, a bright area of 75% positivity meaning that, there is a learning culture when mistakes are disclosed. A similar finding have been reported among Iranian nursing staff with 67% positive responses regarding organizational learning [7]. Also organizational learning positivity of 75.9% is reported among hospital staff in Riyadh, Saudi Arabia [8].

Regarding Non-punitive response to errors dimension, 44% of the participants felt that their mistakes are held against them and 73.8% worry

that mistakes they make are kept in their personnel file. These results are not encouraging. Similarly, in communication openness dimension's positivity was as low as 21.83%. Though 70.2% of the participants reported that they are informed about errors that happen in this unit, more than one third (34.5%) said that they are not given feedback about changes put into place based on event reports. One of the most important priority in patient safety culture is to learn from what went wrong and make sure the mistake was never repeated. The Objectives are not going to meet unless the root cause and preventive measures reaches the user end. Majority (76.2%) reported that staff don't feel free to question the decisions or actions of those with more authority. Only 40.5% reported that they will freely speak up if they see something that may negatively affect patient care. This is in agreement with study done in Netherlands involving 583 staff members in four general hospitals, where a positive response of only 34% was reported for this dimension [9].

Table 1: Response to unit level aspects of patient safety culture

Items	Neutral (%)	Positive response (%)	Negative response (%)
Teamwork within units			
People support one another in this unit.	7.1	83.3	9.5
When a lot of work needs to be done quickly, we work together as a team to get the workdone.	7.1	85.7	7.1
In this unit, people treat each other with respect.	4.8	90.5	4.8
When one area in this unit gets really busy, others help out.	9.5	64.3	26.2
Staffing			
We have enough staff to handle the workload.	13.1	67.9	19
Staff in this unit work longer hours than is best for patient care.	25	8.3	66.7
We use more agency/temporary staff than is best for patient care.	28.6	56	15.5
We work in "crisis mode" trying to do too much, too quickly.	4.8	3.6	91.7
Supervisor/manager expectations & actions promoting patient safety			
My supervisor/manager says a good word when he/she sees a job done according toestablished patient safety procedures.	17.9	54.8	27.4
My supervisor/manager seriously considers staff suggestions for improving patient safety.	21.4	53.6	25
Whenever pressure builds up, my supervisor/manager wants us to work faster, even if itmeans taking shortcuts.	28.6	45.2	26.2
My supervisor/manager overlooks patient safety problems that happen over and over.	17.9	4.8	77.4
Organizational learning - continuous improvement			
We are actively doing things to improve patient safety.	3.6	86.9	9.5
Mistakes have led to positive changes here.	9.5	85.7	4.8
After we make changes to improve patient safety, we evaluate their effectiveness	10.7	86.9	2.4
Non-punitive response to errors			
Staff feel like their mistakes are held against them.	41.7	14.3	44
When an event is reported, it feels like the person is being written up, not the problem.	23.8	24.2	52
Staff worry that mistakes they make are kept in their personnel file	23.8	2.4	73.8
Feedback & Communication About Error			
We are given feedback about changes put into place based on event reports.	27.4	38.1	34.5
We are informed about errors that happen in this unit.	20.2	70.2	9.5
In this unit, we discuss ways to prevent errors from happening again.	20.2	67.9	11.9
Communication Openness			
Staff feel free to question the decisions or actions of those with more authority	17.9	6	76.2
Staff will freely speak up if they see something that may negatively affect patient care.	25	40.5	34.5
Staffs are afraid to ask questions when something does not seem right.	48.8	19	32.1

Hospital level aspects of patient safety culture

Table 2 shows response to hospital level aspects of patient safety culture. Items 10, 11, and 12 of table 4 shows the composite scores of positivity towards hospital level aspects of patient safety culture. The composite scores for all the three dimensions was found to be low and the lowest composite score was found to be for handoffs & transitions and highest for team work across units.

In the present study, the positivity for team work across unit was found to be only 39.78percentage. The percentage of positive response for all the three items of tem work across unit dimension was less than 50%. Compared to the present study findings, Ghobash MM et al (63%)[5] and El-jardali F et al. [6] (56%) found a higher percentage of positivity for team work across units.

Out of all, 72.6% of the participants reported that things "fall between the cracks" when transferring patients from one unit to another and 44% revealed that shift changes are problematic for patients in this hospital. Loss of important patient care information during shift changes were reported by 25% of participants.This is particularly important because previous evidence by Hendrich AL et al have found that some nursing units may "transfer or discharge 40% to 70% of their patients every day", thereby illustrating the frequency of handoffs encountered daily and the number of possible breaches at each transition point [10]. Similar findings have been reported among doctors and nurses while examining communication patterns. They found that thirty one percent of communication exchanges involved interruption, translating into roughly 11 interruptions an hour for physicians and nurses [11].

The other concerning dimension revealed in the present study setting is the perception of management support for patient safety. Out of all, 71.4% perceived that hospital management is interested in patient safety only after an adverse event happens and 44% reported that actions of hospital management does not show that patient safety is a top priority. Only 35.7% reported that hospital management provides a work climate that promotes patient safety. This means that these dimensions need attention and corrective actions. Despite being accountable for the quality and safety of care being provided in their organizations, the leadership at most hospitals placed relatively little emphasis on identifying and addressing safety issues. Goeschel CA et al in a surveyconducted among more than 700 board chairs found that fewer than half rated quality as one of their top two priorities. Few board chairs reported any dedicated training in quality, and large differences were present between board activities in high-performing versus low-performing hospitals [12].

Table 2: Response to hospital level aspects of patient safety culture

Items	Neutral (%)	Positive response (%)	Negative response (%)
Teamwork across units			
There is good cooperation among hospital units that need to work together.	24.2	47.2	28.6
Hospital units work well together to provide the best care for patients.	13.1	46.4	40.5
It is often unpleasant to work with staff from other hospital units.	17.5	40.5	42.1
Handoffs & Transitions			
Things "fall between the cracks" when transferring patients from one unit to another.	9.5	17.9	72.6
Important patient care information is often lost during shift changes.	39.3	35.7	25
Problems often occur in the exchange of information across hospital units.	36.9	44	19
Shift changes are problematic for patients in this hospital	31.7	24.2	44
Management Support for Patient Safety			
Hospital management provides a work climate that promotes patient safety.	14.3	35.7	50
The actions of hospital management show that patient safety is a top priority	15.5	40.5	44
Hospital management seems interested in patient safety only after an adverse event happens	9.5	19	71.4

Outcome measures of patient safety culture

Table 3 shows the percentage of response to outcome measures of patient safety culture. Items 6 and 9 of table 4 indicate the composite percentage of positivity of outcome measures. Though majority of the participants indicated the presence of patient safety problems in their unit (67.9%) and believe that it is just by chance that more serious mistakes don't happen (76.2%),only 40.5% reported that hospital procedures and systems are good at preventing errors from happening. The composite positivity score for the overall perception of patient safety dimension in the present study was also found to be low (32.73%). GhadaAbdelsalam Ahmed Eldeehavefound similar findings in a study conducted among nurses as majority of nurses (57.9%) perceived low patient safety[13]. Study by Ghobashi MM et al. [5] while assessing the patient safety culture in primary health care settings in Kuwait have found that 69% of participants claimed that patient safety is never sacrificed to get more work done and 67% claimed that the systems are good at preventing errors from happening. On the other hand 53% and 55% respectively responded positively regarding that it is only due to chance that serious mistakes don't happen and having no patient safety problems in the unit.[5] In addition, Ammouri et al. (2014), have reported that nurses who perceived more supervisor/manager expectations, more feedback and communications about error, more teamwork across hospital units, and more hospital handoffs and transitions had more overall perception of patient safety [14].

In the present study, the positivity for the event reporting of mistake was found to be less than 50% except for reportingerrors that could harm the patients. This is a pathological culture as this will obstruct the possibility of learning from error.More than half of nurses (68.4%, 63.2% & 60.5%) do not formally report adverse events whether a mistake is made but there is no any potential to harm the patient or a mistake caught and corrected before affecting the patient even if the mistake could harm the patient respectively. Inconsistently, Ross reported that nurses discovered more than 90% of potential medication errors prior to administration [15]. Perhaps, fear of punishment in the current study setting is the cause.

Table 3: Response to outcome measures of patient safety culture

Items	Neutral (%)	Positive response (%)	Negative response (%)
Overall Perceptions of Patient Safety			
It is just by chance that more serious mistakes don't happen around here	13.1	10.7	76.2
Patient safety is never sacrificed to get more work done	22.6	69	8.3
We have patient safety problems in this unit.	21.4	10.7	67.9
Our procedures and systems are good at preventing errors from happening.	19	40.5	40.5
Frequency of Events Reported			
When a mistake is made, but is caught and corrected before affecting the patient, how often is this reported?	22.6	47.6	29.8
When a mistake is made, but has no potential to harm the patient, how often is this reported?	40.5	33.3	26.2
When a mistake is made that could harm the patient, but does not, how often is this reported?	26.2	58.3	15.5
Hospital units do not coordinate well with each other.	15.5	25	59.5

Table 4: Composite scores for dimensions of patient safety culture for all participants (n = 252)

Patient safety culture dimensions	Composite score (%)	Patient safety culture dimensions	Composite score (%)
Teamwork within units	80.95	Overall perceptions of patient safety	32.73
Staffing	33.95	Feedback & communication about error	58.73
Supervisor/manager expectations & actions promoting patient safety	39.6	Communication openness	21.83
Organizational learning - continuous improvement	86.5	Frequency of events reported	46.4
Non-punitive response to errors	13.63	Teamwork across units	39.78
		Handoffs & transitions	30.45
		Management support for patient safety	31.73

Frequency of events reported

Figure 1 reveals the frequency of error reported in last one year by the nurses. It was alarming that 82.1% of the participants never reported any events or patient safety incidents in the last one year. Out of all, only (1.2%) of participants each reported 3-5 and 6-10 events while 15.5% reported 1-2 events.

Several surveys asked nurses to estimate how many and what types of errors were reported by colleagues and themselves. There was significant variation when nurses were asked to estimate how many errors were reported. Respondents in one survey estimated that an average of 45.6 percent of errors was reported [16]. Another multicentric study of medication errors in 29 rural hospitals found that less than half of nurses believed that all medication errors were reported [17], while another study found significant underreporting as only 44 percent of nurses estimated that 25 percent of medication errors were reported [18].

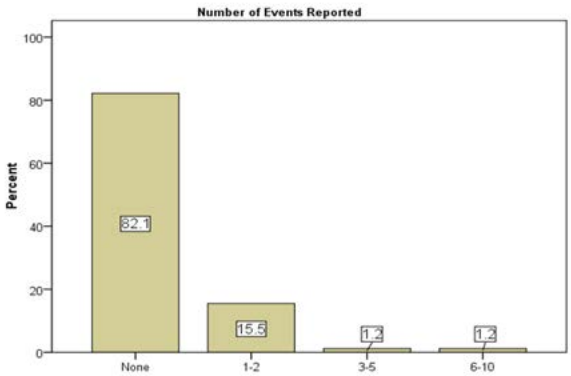

Fig. 1: Frequency of error reported in last one year

Overall perception of patient safety

Perception of patient safety grade showed that most (65.5%) of the participants perceived patient safety grade as acceptable while only 8.3% perceived as excellent (Figure 2).

Fig. 2: Overall perception of patient safety grade among nurses

Similar findings were seen by Balamurugan E et al among nurses working in a tertiary care hospital, South India. Patients' safety grade was reported to be excellent only by 12.7% of nurses, whereas majority reported the patient safety action to be only acceptable (31.9%) [19].

Recommendations

- Encourage voluntary reporting of adverse events. Reporting can be increased through a confidential, dependable, un-biased and a user friendly reporting system. Advocacy and motivation of staff in reporting adverse events along with a good reporting system will create a reporting culture in the hospital. If errors are not reported, there is a chance of repeating errors and new errors may take place. In addition to the corrective action steps should be taken to counteract possible errors in the future.
- Reporting of adverse events should be backed by non-punitive response to errors. Staff should feel free and confident to make error reporting. Errors should be seen as opportunities to learn. Create a learningculture by changing the management and supervisors attitude towards the errors reported. Protect reporting systems/ individuals from being used in litigationand respect the indivdual's right to confidentiality when reporting errors. That is not to say that individuals should never be held accountable for their actions. However, relying on the blame approach alone is likely to drive problems underground and impede an honest and effective strategy to improve patient safety. Errors, per se, present a learning opportunity and one goal should be the chance for open discussion and investigation to remove the cause(s) of an error from the system.
- A system with, only reporting culture and non-punitive response to errors is incomplete. There should be a proper communication and feedback method. The low percentage of positive response to communication and feedback shows there is a gap in the current system. This gap should be minimized as much as possible for smooth functioning of the service.
- Unwillingness of the administration to accept their responsibility for system deficiency and allocation of resources to prevent errors.Make patient safety and error reduction a policy of prime importance by proactively identifying,

promptly recognizing the root cause and designing systems to prevent their recurrence. Allocate enough recourses and funds to support error prevention, remedy and develop safety culture.

- Staff, do not seem to have confidence on the supervisors and management.Hospital management and leadership can indirectly influence quality and safety not only through strategic initiatives, but also directly through direct interactions with frontline workers, leadership walk rounds, and ensuring transparency.
- Enhanced teamwork by interprofessional and multiprofessional cooperation, collaboration between units is important for patient safety improvement.Team work across the hospital units scored less positive responses. This could be addressed by designing strategies to promote interdepartmental and interprofessional coordination and collaboration.
- The analysis indicated that there is a shortage of staff in the hospital and health care providers are overworked. This can have a negative effect on the quality of care given and in turn on the safety of the patients. Staff shortage can be overcome by designing a proper recruitment plan for staff and sing working environment.
- Ensure recommended nurse-patient ratio. Nurses' vigilance at the bedside is essential to their ability to ensure patient safety. Assigning increasing numbers of patients eventually compromises nurses' ability to provide safe care. Several studies have demonstrated the link between nurse staffing ratios and patient safety, documenting an increased risk of patient safety events, morbidity, and even mortality as the number of patients per nurse increases.

Conclusion

As front-line providers, nurses often stop errors, feel powerless to stop errors, make errors, and at times blamed for errors they did not commit. Errors cannot beignored in healthcare. Identification, analysis, correction, prevention can make a long way in improving patient safety. Error reporting should be viewed as a strategy to learn from mistakes and an initial step to create patient safety culture. So the results of the present study findings suggests the need and attention by the organizational leaders to take specific actions to enhance safety within their institutions by improving communication, teamwork, error reporting and response to errors.

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Review Report

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Cadaveric Organ Transplantation and Tissue Harvesting: An Unexplored Domain

Abhishek Yadav[1], Arijit Dey[2], Kulbhushan Prasad[3], Sudhir K. Gupta[4]

Abstract

The Transplantation of Human Organs is used in treatment of patients who has irreversible damage to their organs. The demand of various organs for transplant patients far exceeds than the number of organs actually donated but transplantation is offered only to patients who have a prospect of achieving an acceptably good quality and duration of life after transplantation.Since the inception of organ transplantation, the huge gap between the demand and supply of organs has been widening exponentially. The growing need for transplantable organs necessitates finding sources other than heart beating donors (HBD), and living donors (LD). The other probable source of a transplantable organ from Non Heart Beating Cadaver (NHB) or a Donation after Cardiac Death (DCD) has not been explored extensively. An important aspect of organ donation is harvesting the selected organ within a stipulated time period, known as Warm Ischaemia Time (WIT). If an organ is retrieved by the organ retrieval team within the specific WIT attributed to different organs, then there are increased chances of their proper functioning post transplantation with reduced incidences of graft rejection. Thus, detecting the viability of an organ and its functionality within the accepted range of normal limits is of paramount importance for successful organ harvesting and its subsequent transplantation. The authors discuss about the various intricacies of harvesting organs from Non Heart Beating cadavers brought for autopsy, thereby utilizing a large pool of still inaccessible organs for the greater benefit of the entire society.

Keywords: Organ Retrieval; Therapeutic Transplantation; Non Heart Beating Cadaver; Warm Ischaemia Time.

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Introduction

The Transplantation of Human Organs is an important emerging concept in treatment of patients who has irreversible damage to their organs. Though Medical Science cannot replace God in making a human body but efforts can be made due to availability of latest technology to treat and allay the diseases of individuals and help the mankind as a whole. Transplantation of Human Organs and tissues is a noble cause which the Government of India is also taking very seriously with various National Donor programs and Registry [1]. The demand of various organs for transplant patients far exceeds than the number of organs actually donated but transplantation is offered only to patients who have a prospect of achieving an acceptably good quality and duration of life after transplantation [2].

Current Challenges for Organ Donation

Since the inception of organ transplantation, the huge gap between the demand and supply of organs has been widening exponentially. The reasons are manifold like:

1. Extremely meager amount of organ donation.

2. Elaborate selection criteria for organ donation, rendering most organs unsuitable for transplantation both in dead and living.
3. A very small number of registered Transplantation centers.
4. Lack of an Expert Organ retrieval team in hospitals.
5. Poor infrastructure& logistic facilities for organ retrieval, transport and its transplantation within the stipulated time period.
6. Huge financial burden on the patient's relatives of an organ transplantation surgery and its long term maintenance.
7. Lack of co-ordination between the different Clinical Departments of a Hospital.
8. A dire lack of awareness about the necessity of organ donation in the general population.

All these reasons result in very low percentage of organ donation in Indian scenario, and even poorer success rate post transplantation.

Non-Heart Beating Donors- Anunexplored Domain

Heart Beating Donors (HBD) include organ donation from a living person or the patient who is brain dead but with a functioning heart. The growing need for transplantable organs necessitates finding sources other than heart beating donors (HBD) and living donors (LD).[3] The other probable source of a transplantable organ from Non-Heart Beating Cadaver (NHB) i.e. a Donation after Cardiac Death (DCD) has not been explored extensively. Maastricht (Netherlands), Japan and parts of the United States of America as well several units in the United Kingdom, have long standing programs to retrieve organs (principally kidneys) from non-heart beating donors [4]. A major limiting factor to the widespread adoption of a non-heart beating organ donation and transplantation is the uncertainty regarding the function of the graft once transplanted. Delayed function, rejection and extended hospital stay are all a concern with non-heart beating organ donation but primary non-function has more significant consequences.

Viability of an Organ: Concept of Warm Ischaemia Time

An important aspect of organ donation is harvesting the selected organ within a stipulated time, known as Warm Ischaemia Time (WIT). The onset of ischaemia immediately impairs oxidative metabolism, depletion of adenosine triphosphate (ATP), an increase in anaerobic glycolysis and the inhibition of Na+/K+ ATPase. Membrane transport mechanisms will slow down, causing intracellular accumulation of water and ions which results in cell oedema and disruption of the cytoskeleton. Impaired oxidative metabolism triggers the formation of reactive oxygen species (ROS) that have a direct detrimental effect on the cell [5]. If an organ is retrieved by the organ retrieval team within the specific WIT attributed to different organs, then there are increased chances of their proper functioning post transplantation with reduced incidences of graft rejection [6]. Thus, detecting the viability of an organ and its functionality within the accepted range of normal limits is of paramount importance for successful organ harvesting and its subsequent transplantation [7]. Several biological factors influence short-term outcome as well as long-term function of transplanted organs and most of the research till date is concentrated on this aspect only [8].

In 2002 Gamez et al. [9] performed 5 lung transplants from uncontrolled NHBD (Maastricht category I, dead on the arrival at OR): the maximum WIT was 120 min (90 min from cardiac arrest to arrival at the hospital Emergency Unit and 30 min to the start of preservation manoeuvres). Lung transplants from NHBD showed excellent gas exchange in the post-operative period and a post hospital evolution similar to recipients from HBD. Nguyen et al. [10] (Maastricht category III) got a biliary complication rate similar in NHBD and in HBD and suggested that for liver transplantation, the WIT should be less than 30 min and the CIT should be less than 9 hour. Regarding kidney transplantation, Sanni et al. [11](Maastricht categories II and III) showed that WIT should be 37 minutes and also highlighted that survival rates and graft quality at 1 year were not different between the two groups of HBD & NHBD donors. In 2009 Ali et al. [12] described cardiac resuscitation in a controlled NHBD after a WIT of 23 min.

Tissue Harvesting

Bio banking of stem cells from bone marrow, umbilical cord, and adipose tissue is increasingly used by pathologist to maintain cell lines and bioengineering. Newer applications of autologous banked tissues for future use are being regularly reported with use of blood vessels, testicular and ovarian tissues, sperm, cord blood, placenta etc [13]. Skin donation can be taken upto 12 hours and with precautions even upto 24 hours after death.

The donation is possible if the deceased person was more than 16 years of age and was not harboring transmissible infections such as Hepatitis B, Hepatitis C and HIV. Those suffering from skin cancer, septicemia and with damaged skin e.g. scleroderma, pemphigus are not suitabledonors [14]. Castagnoli C [15] in his study, investigated the viability of postmortem allografts (n=350) harvested from 35 different donors, using theMTT salt assay. The viability index (VI) of skin is expressed as the ratio between the optical density (O.D.) produced in the MTT assay by the skin sample and its weight in grams. The results indicated that samples tested within 12—30 hours from harvesting have an average viability index of about 75 with little variation. Samples tested within 60 hours have an average viability index of 40, showing a viability decrease of about 50%.

Viability Assay

A viability assay is an assay to determine the ability of organs, cells or tissues to maintain or recover viability. Viability can assay mechanical activity, motility (spermatozoa or granulocytes), contraction (muscle tissue or cells), mitotic activity, etc [16]. Different viability assay commonly employed include the ATP test, Calcein AM, Clonogenic assay, Ethidium homodimer assay, Evans blue, Fluorescein diacetate hydrolysis/ Propidium iodide staining (FDA/PI staining), Flow cytometry, Formazan based assays (MTT/XTT), Green fluorescent protein, Lactate dehydrogenase (LDH), Methyl violet, Propidium iodide, DNA stain that can differentiate necrotic, apoptotic and normal cells, Resazurin, Trypan Blue: a living cell exclusion dye (dye only crosses cell membranes of dead cells) and TUNEL assay [17].

Recommendation

Future research should be carried out to assess the viability of certain organs and tissues (lung, heart, liver, kidney, cornea, skin, bone) in a Non Heart Beating patient at different time interval which can easily be carried out in cases brought for autopsy, as only small amount of tissue needs to be collected for assessing the viability and the ethical part including the consent of the relatives of the deceased can be fulfilled easily. The viability may be tested for different time interval later on after having a baseline data and the research may be continued in the direction of new results obtained from further studies. A large pool of organs can be used for the greater benefit of the entire society.

Conflict of Interests: Nil.

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Review Report

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National Quality Assurance Program

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Abstract

Quality in healthcare is an attribute; it is complex construct that has several tangible & intangible dimensions including individual patient interest and larger societal concerns about improvement in health outcomes. National Quality Assurance Program is an NHM initiative to provide accessible, affordable and equitablequality of services in Public Health Facilities. The program has been launched in November 2013 and implemented in all the States & Union Territories. Under NQAP, National Quality Assurance Standards (NQAS) have been formulated and incorporated in the tools prepared for conducting the assessments in public health facilities. Indian Healthcare system is 3 tier in nature, keeping it in view and for meeting the requirements, Quality Standards for District Hospitals, CHC, PHC/UPHC have been formulated in subsequent years for implementation. The entire framework of Quality Assurance Standards has been prepared by laying prominence on Donabedian Model of Structure Process and Outcome. The program lays emphasis on gap closure activities those are found during the assessment. There are 8 key features & explicit measurement system in the program. The entire focus of the program is on continual quality improvement of service delivery in public health facilities, in years to come. *Conclusion:* Quality Assurance Programmemeets the need of Public Health system in the country which is transparent, reliable & sustainable. The program endeavor to serve the country by improving the 'Quality of Care' provided in public health facilities.

Keywords: National Quality Assurance Program; National Quality Assurance Standards.

Background

National Health Mission is one of the most aspiring health sector domainin India. National Rural Health Mission has been launched in year 2005 with an aim to provide accessible, affordable and quality health care to the rural population. In year 2013, it has been extended in urban areas and has been transformed into National Health Mission. Since the inception of NHM, Quality had remained as one of the focused areas of implementation. Earlier in this efforts ISO was implemented in many of the health facilities. NABH was also established in year 2005 and propagated as accreditation system in healthcare, however full accreditation was achieved by only few of the health facilities. In year 2012, Ministry of Health & Family Welfare analyzed the stand alone efforts undertaken till date and found that although quality interventions have been undertaken in due course of time, still there is a requirement of a Pro Public Health Quality System. Hence, National Quality Assurance Program was launched in 2013 with an aim of developing a sustainable inbuilt quality system within the public health facilities.

National Quality Assurance Program (NQAP) is one the versatile program those have been implemented under NHM. Under NQAP, after extended deliberations of 16 months "Operational Guidelines for Quality Assurance in Public Health Facilities" were developed and released in 2013. Initially Quality Standards for District hospital were released followed by Quality Standards for FRUs, PHC & UPHCs. Quality Standards for District Hospitals are ISQUa (International Society in Healthcare) certified first public health standards. National Quality Assurance Standards were formulated by conducting consultations workshops with involvement of State Government Representatives, Development Partners, Academic Institutions, Public Health Experts & Ministry Officials. These were framed by considering the public health challenges and constraints that are encountered in the health facilities along with a focus on quality improvement initiatives. Ministry of Health & Family welfare is supporting the States and Union Territories in Financial & Operational implementation of Quality Assurance Program. Incentives are also associated with the implementation and certification of the targeted facilities under NQAP.

National Quality Assurance Standards

Quality in healthcare is multidimensional, under NQAP the major emphasis have been levied on Structure, Process and Outcome approach. The present set of guidelines have been prepared comprehensively beginning with

- Areas of concerns,
- Defining its standards,
- Measurable elements and
- Checkpoints

both from service provider and service seekers aspect. There is a prudent mix of technical, infrastructural and clients perspective while framing these standards. The National Quality Assurance Standards are organised around eight 'Areas of Concern' as described in Figure 1. The 8 areas of concern are further sub-divided into Standards and Measurable Elements which are covered under all checklists (Fig. 2). There is an explicit measurement system of NQAP. The filled tangible department wise checklists form the part of the Assessors guidebook for assessment and hence provides an ease of assessment to the assessors.

Fig. 1: Eight areas of Concern under NQAP

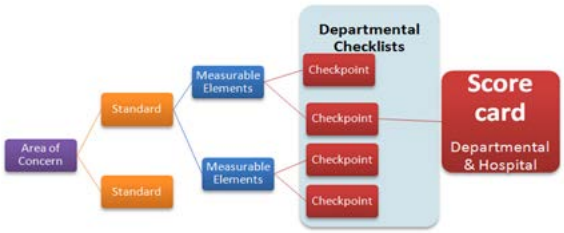


Fig. 2: Relationship between different component under NQAS

Keeping in view, the variability in the delivery of scope of service different standards and checklist have been prepared and introduced.

Table 1: Measurement System for all level facilities

Components	District Hospitals	CHC	PHC	U-PHC
Area of Concern	8	8	8	8
Standards	74	63	50	35
Measurable Elements	315	293	245	198
Checklists	18	12	6	12

The QA programme targets gaps finding, (in each area of concern, as well in each department of health facility) followed by prioritisation of the gaps, and action planning for closure of the gaps. The facilities are required to develop departmental SOPs, meeting regulatory compliances (Blood Bank Licences, Authorisation for Biomedical Waste, Atomic Energy Regulatory Board requirement, Fire Safety, etc.), strengthening system of infection control, instituting a system of external quality

assurance in hospital laboratories, creating amenities for patients & their relatives, etc.

Key Features of the Program

There are 8 key features in the program as enlisted below:

- *Unified Organizational Framework*

  Under NQAP the organizational framework has been constituted at all levels across all the States/ UTs

  - National level - Central Quality Supervisory Committee (CQSC)
  - State Level - State Quality Assurance Committee (SQAC) & functional arm as State Quality Assurance Unit (SQAU)
  - District Level - District Quality Assurance Committee (DQAC) & functional arm as District Quality Assurance Unit (DQAU)
  - Facility Level - District Quality Team

- *Empanelment of Assessors*

  - Internal Assessors - Pool of Internal Assessors is created at State level, in order to support the States in effective implementation of the program at State & Facility level .
  - External Assessors – Pool of External Assessors is created at National Level, in order to assess the facilities for National Certification. External Assessors enact as Internal Assessors for their own States & External Assessors for other States assessment.

  The pool of External Assessors is empanelled at NHSRC level wherein they have been provided a 5 days training and had cleared a post training evaluation.

- *Flexibility of adopting standards*

  Every State is distinct in its own way, so is there ways of implementation of the Quality assurance program. States are provided leverage in respect of the implementation of the program by doing the customization of these standardized checklists as per their delivery of scope of services in public health facilities. However customization is limited to only incorporating changes in Measurable Elements, Checkpoints and Means of Verification; Standards and Essential commodities as per IPHS norms are not covered in scope of customization. Customization itself is a dynamic process wherein the distinct components of the state is incorporated; for instance de-addiction is major issue encountered in Public health facilities of the State of Punjab hence new standard various means of verification were incorporated for the State to reassure the delivery of quality services in this domain. Another illustration is in the State of Kerala wherein Palliative care is anessential component of all the public health facilities, hence means of verification pertaining to palliative care is incorporated especially for the State and furthermore customization shall be incorporated as per the states requirement.

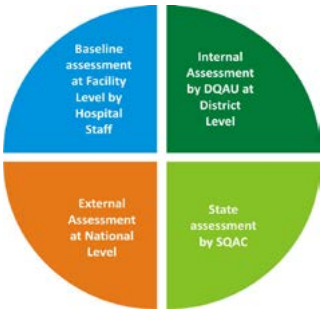
- *Training & Capacity Building*

  There are 5 types of trainings those are imparted under this program namely:-

  - Awareness Workshop – To sensitize the State level Officials on Quality Assurance Program.
  - Internal Assessor 2 days workshop – To sensitize the staff about how methodology of conducting assessments.
  - Service Provider Training 3 days workshop – To sensitize the facility health care professionals for preparing the action plan for traversing gap found during assessments.
  - External Assessor 5 days training – To empanel the pool of external assessors for undertaking certification audits.

  Thematic Training – To guide the hospital healthcare professional on implementation of theme related activities.

- *Assessments & Scoring*



A set of checklist have been provided at "Assessors Guidebook". Each Checkpoint is scored as 0 for Non compliance, 1 for partial compliance & 2 for full compliance in against the Checkpoint by following the tracers provided in Means of Verification.

- *Certification*

  Certification is a voluntary dynamic process; wherein the facility tries to achieve minimum defined quality standards for attaining certification. Certification under NQAS is provided by Government of India, illustrating that the services provided in a particular facility is uptothe National Quality Assurance Standards.

  - State Certification - Assessment conducted by team of Internal Assessors from within the state, facility scoring minimum 70% is recommended for certification. The entire process of certification is conducted by SQAC.
  - National Level Certification – After State Certification, facilities applies for National Certification and from pool of empanelled external assessors the assessment is conducted. If facility attains 70% or above they are awarded with National Certification. As it is an ongoing cycle surveillance audit on yearly basis and recertification audit after 2 years is conducted.

- *Incentivization*

  Financial & Non financial incentives are awarded once the facility is National certified.

Current Status

- In 4 years of implementation of Quality Assurance Program in States & Union Territories, a pool of 2399 internal assessors have been created for supporting the states in conducting assessment and undertaking gap closure activities at the facility level. Where in a pool of 199 external assessors have been created at national level for conducting the certification audits.
- 58 health facilities have been assessed under National Quality Assurance Program till date, in which 49 health facilities have been certified and more than 50 are in pipeline under the program. The progress embarks the quality improvement initiatives undertaken at the facility level.
- In 18 States, 788 Urban Primary Health Centre have been assessed in since April 2016 for highlighting & addressing the Urban health facility requirements.
- With the roll out of National Quality Assurance Program, other program i.e. Kayakalp, LaQshya and SwachhSwasthSarvatra have also been included in pool of the NHM Programs to improvise the cleanliness & infection control practices within & outside the facility.

Region Wise Status of Certified Facilities

- 19 Health Facilities in North
- 2 Health Facilities in East
- 21 Health Facilities in West
- 2 Health Facilities in South
- 1 Health Facility in Northeast
- 4 Health Facilities in Southeast

Although Quality is considered an inbuilt approach in all the programs, implementation &assessing quality in public health facilities remained a big challenge. National Quality Assurance Program had tried to address the inequalities found in the different health facilities; based on their delivery of scope of the services. As we all know the different quality systems have stronger impact on the designing &delivery of healthcare services in the facilities; National Quality Assurance Program is an initiative to bring all the health facilities to a common platform in regards to provide and attain holistic approach of 'Quality of Care'.

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Review Report

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Computerized Patient Management System (CPMS) at AIIMS Jodhpur: An Outcome Based Paperless Hospital Management

Rajesh Sharma[1], Anish Singhal[2], Yogendra Raj Singh[3], Rahul Dhoot[4]

Abstract

A hospital information system (HIS) is an element of health informatics that focuses mainly on the administrational needs of hospitals. HIS is a comprehensive, integrated information system designed to manage all the aspects of a hospital's operation, such as medical, administrative, financial, and legal issues and the corresponding processing of services. With the help of HIS, dealing with patient records has become very easy and manageable. The reliability, integrity, transparency and reproducibility of the records are best maintained accordingly. HIS provides a common source of information about a patient's health history. We, at our Institute have learnt that proper HIS can indeed mitigate many pitfalls encountered in the traditional paper based patient information system and strongly advocate the use of computerized patient management system (CPMS).

Keywords: Hospital Information System; Computerized Patient Management System.

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Introduction

A hospital information system (HIS) is an element of health informatics that focuses mainly on the administrational needs of hospitals. HIS is a comprehensive, integrated information system designed to manage all the aspects of a hospital's operation, such as medical, administrative, financial, and legal issues and the corresponding processing of services.All India Institute of Medical Sciences (AIIMS), Jodhpur is one of the six new AIIMS established by the Ministry of Health & Family Welfare, Government of India under the Pradhan Mantri Swasthya Suraksha Yojna (PMSSY). AIIMS, Jodhpur is one of the finest hospitals in India, providing quality patient care from 27th July 2013. Around 576,670 patients have already been served by the hospital. The mission of the organization is to establish a centre of excellence in medical education, training, health care and research imbued with scientific culture, compassion for the sick and commitment to serve the underserved.

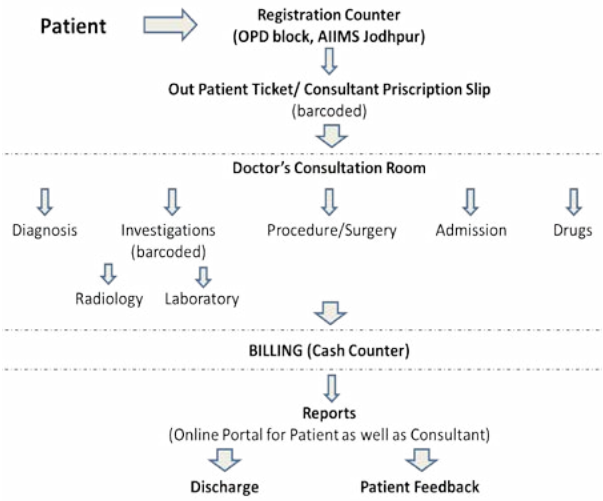
AIIMS Jodhpur has a very robust IT infrastructure for patient management, teaching and research purposes. The improvements of our organization are best designed with the help of our Hospital Information System (HIS). With the help of HIS, dealing with patient records has become very easy and manageable. The reliability, integrity, transparency and reproducibility of the records are best maintained accordingly. HIS provides a common source of information about a patient's health history. These systems enhance the ability of health care professionals to coordinate care by providing a patient's health information and visit history at the place and time that it is needed. HIS provide internal and external communication among health care providers.

Patient servicesinclude Computerised Patient Management System (CPMS) which is a single window software for managing all patient related activities at AIIMS, Jodhpur. Online patient

registration, out patient management, admissions and in patient management, investigation ordering and retrieval of reports, patient referral, personnel management, store distribution, equipment management, blood bank, medico legal aspects, health statistics, family planning reproductive health and maternal and child health activities can be easily managed using CPMS. In addition the system also caters to ancillary hospital services such as ambulance administration, Central Sterile Services Department (CSSD), Biomedical Waste Management (BMW), operation theatre services, ICU, wards and peripheral healthcarecentres of the institution (rural and urban). It also assesses real time monitoring of patient movement, inter-hospital transfer of patient and related health information.

Design and Implementation

The process for the patients to get the service at All India Institute of Medical Sciences, Jodhpur is very quick and easy as demonstrated in the figure 1. The Patient has to first register by sharing the demographics at the Registration Counter.



After registration, the OPD ticket or the prescription slip of the respective consultant is issued from the OPD ticket counter. Then the patient has to go to the consulting doctor. The doctor through Consultants portal then fills the diagnosis, orders investigations, prescribes medications etc. in the Hospital Information System. Billing for admission, investigation and procedures is also completed with the help of HIS. The sample for the investigation is well differentiated and managed with the help of barcode. The reporting of the investigations is also done using HIS.

There are many other layers in HIS which is well distributed under user panels so that different categories of staff and departments can work co-ordinately. There are many user panels for the users like *central ward admin panel* which manages the bed allotment and bed occupancy, *nurse panel* which deals with patients at ward regarding their vital sign, intake/output, drug delivery, notes, indenting any item from store, *Store panels* which is also divided into 3 layers i.e Central Store Admin, Store Admin, Distribution Store Admin and their work is distributed accordingly and there are also user panels like *OT Admin* which manages operation theatre, *CMS Panel* which manages approval or disapproval for Free of Cost Patients. There is one master panel named as *Developer* in the HIS. That master panel has the power to manage all the user panels. This panel has control over the HIS. This is one of the unique panels in the HIS. Another unique feature is that patient can see all the activities related to him/her like investigation reports, payment receipts, diagnosis etc. on Patient Portal.

Value Derived/Outcomes

All outpatient department (OPD) activity, patient registration- one time, bar coded, consultation, prescription, investigation, vaccination, drugs, injection, physiotherapy etc. All are done online. All inpatient activity admission, patient record, medical treatment, surgical treatment and procedures, investigation, medico legal and police formalities, discharge, death certificates, scheduling for OT, allotment / reservation of hospital beds and patient referral, all are done online.Pharmacy and stores - online procurement and distribution of drugs and pharmacy without the need to maintain registers at every point, automatic debit of indent from pharmacy stock indent can be generated in any, OPD, ward, theatres, stock keeping, online tracking of pharmacy stick with warning on low levels and expiry dates. Equipment's tracking of all hospitals equipment from bedpans to Lasers with one time online data entry. Linen and laundry stores- tracking of all linen with one time data entry, issue, condemnations, and repairs all are tracked online.Blood Bank Management is completely online from blood donation, its storage and the issue of blood bank and all steps are monitored. The system tracks each cash deposit of any kind and cash exit from the hospital at all cash counters. It keeps track of refunds and generates a detailed daily cash record.

Hospital kitchen, all dietary prescriptions and tracking is done online. Diets can be prescribed only to bona-fide patient. Therefore, misuse is avoided.Biomedical waste generation, its transport and disposal are tracked from each collection site to the incineration site, with warning if a bag is missed. The total amount of waste generated in any hospital system is recorded category (as per safety guidelines) for monitoring purpose.

All health statistics currently being collected by the department of health and family welfare such as admission, morality, infant mortality, vaccination, family planning procedures etc are catered to by the CPMS. All works and records related to maternal and child health services can be done online and all records can be retrieved intently.

We have also started one dedicated SMS portal for all the patients who require a follow up visit and the reminder for the same is sent automatically to those patients 48 hours prior to their scheduled visit at AIIMS Jodhpur for follow up. This service was started this year and we have already sent >100000 messages to the patients concerned. In order to join this initiative one and foremost requirement is that we should have the infrastructure in place, which comprises of a user database server, where our users' ID and password are stored along with a RADIUS server for authentication and logging.

The country already has the advantage of a strong IT fibre backbone and indigenous satellite communication technology with trained human resources. With enhanced efforts, telemedicine could help bring specialized healthcare to the remotest corners of the country. Telemedicine is likely to provide the advantages of tele-diagnosis, especially in the areas of cardiology, pathology, dermatology, and radiology besides effectively operationalizing Continuing Medical Education (CME) programmes. AIIMS Jodhpur takes pride that most of the vision of MOHFW and MeITY has been implemented such as Telemedicine.

Telemedicine can be defined as the use of electronic communication technology to exchange patient information and provision of health care services at remote locations. Global Telemedicine has gone far beyond providing health care services alone. It is now being extensively used also for education, research and management of data. It is, however, paradoxical that despite India's strength in information technology, the use of telemedicine is still at a fairly nascent stage especially in the public health sector. AIIMS Jodhpur has already started Telemedicine setup and acts as the Nodal Center of referral and consultation of patients of Pali District Hospital.

Apart from patient management services IT Cell at AIIMS Jodhpur also caters for many other services including e-library, video conferencing room with ability to perform 3 simultaneous conferences at a single time, not only we are publicize our public lectures live on YouTube, but OT Procedure also broadcasts to the lecture theatres here in AIIMS Jodhpur, through our in house development we creates a robust user interfaced websites and Recruitment portal.We are providing Eduroam services at AIIMS Jodhpur, Edurom is a global service that enables students, researchers and staff from participating institutions to obtain Internet connectivity across campus and when visiting other participating institutions by simply opening their laptop or activating their smartphone or other portable device through Wi-Fi. With Eduroam, we get Internet access not only via your institution's wireless network, but also when visiting other participating universities, colleges, research centres and libraries. This facility enables users visiting other Eduroam enabled institutions globally to get authenticated and connected to the visiting institutions network using their home institution ID and password and use it for free internet access.

Use of Information and Communication Technology (ICT) in health can be divided broadly in four areas viz. Education, Research, Referral, and Management of Data.

- Health and Education: When ICT is applied to medical education, it is possible to make high quality education available pan India seamlessly.
- Health Research: ICT can potentially transform the medical scene in India, by bringing about a sea-change in medical research. From traditional clinical research to the modern synthetic biology-based research, the opportunity is immense. Work on problems such as Cancer prevention, screening, diagnosis, and therapy can benefit from inter-disciplinary cooperation. Medical fraternity has availed such benefits when MRI and Nuclear Imaging were integrated into medicine a few decades ago.
- Hospital Management System: It is common experience that work places in the health systems are not adequately governed especially in remote areas. The management of medical colleges and district hospitals can be strengthened significantly with the application of Hospital Management System.

- Health and Management of Data: Electronic Medical Records (EMR), is a fundamental pre-requisite in using ICT seamlessly in healthcare. While EMR is available in several forms, size, shape, and format, Indian medical community with a specific mandate should standardize EMR, create and establish ICT platforms for using EMR based systems, for universal benefits.

The vision of Digital India is included in our endeavours to achieve a paperless hospital management and Date Storage system.

Concluding Remarks and Future Direction

The hallmark of any information system, whether it is on paper or computerized (paperless) lies on three tenets:

a. patient identification and starting of the workflow of those patients
b. Recording and maintenance of the patient's data by the primary consultants as well as diagnostic consultants
c. Retrieval of the data for patient management or research purposes

We all are well aware that the all these three parameters are cumbersome and tedious if the patient care provider centre still caters to the need with a filing system on paper. In our country health care providers are under tremendous pressure to treat the patients, the numbers of which are growing exponentially and shortage of the medical staff. The need of the hour therefore is to digitalize our patient care system in an efficient way which meets the needs of the day.

We, at our Institute have learnt that proper HIS can indeed mitigate many pitfalls encountered in the traditional paper based patient information system and strongly advocate the use of computerized patient management system (CPMS).

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Competing interests: There are no competing interests. Also all authors disclose that they do not have any conflict of interest in accordance with journal policy.

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Review Report

Indian Journal of Hospital Administration
Volume 2 Issue 1, January - June 2018

Review of Central Sterile Supply Department (CSSD) in a Hospital

Sonal Chaturvedi[1]

Abstract

Central sterile supply department (CSSD) forms an important and integral part of a hospital. Efficient and effective sterilization and aseptic technique are in the fore front of the continuing battle against hospital acquired infection. Also since the demand of hospital services all over the world have increased tremendously, it was considered that all large and medium size hospital must have a properly functioning CSSD.

Keyword: CSSD; Sterilization; Infection.

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Definition of CSSD

It may be defined as a service responsible for processing, issue ,and control of professional supply and equipment to various areas in a hospital.

The central sterile services department (CSSD), also called sterile processing department (SPD), sterile processing, central supply department (CSD), or central supply, is an integrated place in hospitals and other health care facilities that performs sterilization and other actions on medical devices, equipment and consumables; for subsequent use by health workers in the operating theatre of the hospital and also for other aseptic procedures, e.g. catheterization, wound stitching and bandaging in a medical, surgical, maternity or pediatric ward.

The operations of a Central Service department usually consist of the reprocessing, that is cleaning, disinfecting, and sterilizing of reusable medical equipment. Reusable medical equipment, or RME, can consist of any medical equipment from stainless steel surgical instrumentation, to IV pumps and crash carts. do not have direct contact with a patient.

Sterilization is the process of destroying all living organisms on an item and is the main task of most Central Service departments. Items to be sterilized must first be cleaned in a separate decontamination room and inspected for effectiveness, cleanliness and damage. There are multiple methods of sterilization, and which one is used is dependent on many factors including: operational cost, potential hazards to workers, efficacy, time, and composition of the materials being sterilized. In the US, one of the cheapest and easiest methods is steam sterilization, where instrumentation trays and packages are placed in a chamber which is them filled with steam (usually 250-270°F), killing all microorganisms. Sterilization can also be achieved using Ethylene Oxide (ETO) gas. This process was created in the 1950s by the US military and is used on items that cannot withstand the high temperatures of steam sterilization. ETO sterilization takes far longer than steam sterilization and is hazardous to workers, so alternative methods were created in the 1990s. The most common method for sterilizing at low temperatures today is by using hydrogen peroxide plasma, which has near zero risk to workers and cycles take a fraction of the time of ETO sterilization.

Depending on the healthcare facility's policy, there will be either an event related or time related sterile storage policy. If the policy is time related, an expiration date is placed on the sterile package, before being supplied to the end-user as a *sterile* product. If along the supply route, the sealed package got damaged or opened by a health worker, it needs to be returned to the CSSD for re-sterilization. If the healthcare facility's policy

is event related, the package is considered sterile until an event occurs to compromise it's sterility (e.g. opened, dropped package, high humidity conditions, torn muslin wrap, etc.)

Planning and organization of CSSD

The CSSD should be planned and organized with the following objectives in mind-

- To provide sterilized materials from a central department under proper control, so as reduce the incidence of hospital infection.
- To provide maintenance, cleaning, storage and issue of surgical supplies.
- To provide costly heat sensitive items to highly specialized units such as cardiac catheter laboratory, heart lungs machine catheter\ tubing etc.
- To provide essentially needed standardization in conformity to the prescribed standards.
- To provide education to the nursing and paramedical staff.
- To provide quality control measures and to institute research.
- To provide sterilized linin and portable suction apparatus.
- To provide inventory control management system of all the eqipments used in O.T.

Area Requirements

The minimum area requirement per bed is as follows

75 - 99	BEDS	10 SQ.FT. PER BED
100 -149	BEDS	9 SQ. FT. PER BED
150 - 199	BEDS	8 SQ. FT. PER BED
200 – 249	BEDS	8 SQ. FT. PER BED
250 - 299	BEDS	7 SQ. FT. PER BED
300 AND ABOVE	BEDS	7 SQ. FT. PER BED

Departments or basic division of CSSD

Sterile processing departments are typically divided into four major areas to accomplish the functions of decontamination, assembly and sterile processing, sterile storage, and distribution.

Decontamination

- Decontaminating used surgical instruments and other medical devices
- Operating and maintaining special decontamination equipment like automatic washers
- Inspecting decontaminated items to make sure they are clean
- Assembly
- Organizing clean items and packaging them into appropriate instrument trays and sets

Sterilization and storage

- Sterilizing assembled trays of instruments
- Precisely operating and monitoring special sterilization equipment like autoclaves
- Keeping detailed records of items that have been cleaned, sterilized, and stored

Distribution

- Stocking crash carts
- Organizing sterilized medical supplies
- Ensuring that sterile supplies don't become outdated / preventing event related sterility issues
- Delivering sterile supplies where they are needed and picking up dirty ones

Layout of CSSD- The flow of equipment from the receiving counter to dispensing counter should be unidirectional through the various section in the department, ensuring that no contamination of sterile goods.

Work flow diagram

Dirty Area Clean Area Sterile area Issue area

Organization of work flow

Laundered linen, clean goods ,and dressings from manufactures are added to the washed and dried reusable items , which are made into suitable packs for sterilization and issue . it is important to ensure by a careful and logical workflow that clean packs awaiting sterilization can at no time be mistaken with sterile supplies. If this arrangement is not made, mistaken can occur and clean and

sterile can get mixed up. Further a proper work place arrangement, which ensure that everything required is in the right place , in the right quantity, and at the right time, will of itself achieve an economy of labour and reduce running costs.

Equipment in CSSD

These are as follow –

a. Ultrasonic cleaner – for hollow instruments
b. Washer disinfected – for cleaning and dis infection
c. Gloves processing unit
d. Drying cabinet
e. Ethylene oxide sterilization chamber (E T O Sterilizer) – Used for het sensitive article eg. Plastic and rubber goods, electricalappliances, cardiac catheter etc.
f. Sealing machine – to seal the plastic wrapping for gas sterilization.
g. Autoclaves
h. Compressed air controlled pressure guns
i. Needle sharpning machine
j. Automist - for fumigation of sterile area
k. Furniture, sink, cupboard, waste unit, folding table, papper bags, pressure sensitive tape bag and box marker, container, chairs etc.

Staffing pattern in CSSD

- Supervisor with training and experience in cssd.
- CSSD technician
- CSSD attendant
- Messengers forward ,OT delivery
- Boiler attendant
- Clerks
- Sweepers.

As arule of thumb a CSSD would require one CSSD workers per 30 beds plus one supervisor. A 200 -300 beds hospital would need 10 -15 persons of various categories as given above.

Conclusion

The CSSD is a necessity for hospital with bed strength of 100 or more. It reduces hospital acquired infection to a great extent. It reduces additional workload on nursing personnel, so they can give more time to patient care. It can decrease mortality and morbidity and significant reduces in the cost of expensive antibiotics. It can increase turnover of patient due to decrease length of stay in the hospital.

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Indian Journal of Anatomy	4	8500	8000	664	625
Indian Journal of Ancient Medicine and Yoga	4	8000	7500	625	586
Indian Journal of Anesthesia and Analgesia	4	7500	7000	586	547
Indian Journal of Biology	2	5500	5000	430	391
Indian Journal of Cancer Education and Research	2	9000	8500	703	664
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Indian Journal of Forensic Odontology	2	5500	5000	430	391
Indian Journal of Hospital Administration	2	7000	6500	547	508
Indian Journal of Hospital Infection	2	12500	12000	938	901
Indian Journal of Law and Human Behavior	2	6000	5500	469	430
Indian Journal of Library and Information Science	3	9500	9000	742	703
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Indian Journal of Medical & Health Sciences	2	7000	6500	547	508
Indian Journal of Obstetrics and Gynecology	4	9500	9000	742	703
Indian Journal of Pathology: Research and Practice	4	12000	11500	938	898
Indian Journal of Plant and Soil	2	65500	65000	5117	5078
Indian Journal of Preventive Medicine	2	7000	6500	547	508
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Indian Journal of Surgical Nursing	3	5500	5000	430	391
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Indian Journal of Waste Management	2	9500	8500	742	664
International Journal of Food, Nutrition & Dietetics	3	5500	5000	430	391
International Journal of Neurology and Neurosurgery	2	10500	10000	820	781
International Journal of Pediatric Nursing	3	5500	5000	430	391
International Journal of Political Science	2	6000	5500	450	413
International Journal of Practical Nursing	3	5500	5000	430	391
International Physiology	2	7500	7000	586	547
Journal of Animal Feed Science and Technology	2	78500	78000	6133	6094
Journal of Cardiovascular Medicine and Surgery	2	10000	9500	781	742
Journal of Forensic Chemistry and Toxicology	2	9500	9000	742	703
Journal of Geriatric Nursing	2	5500	5000	430	391
Journal of Microbiology and Related Research	2	8500	8000	664	625
Journal of Nurse Midwifery and Maternal Health	3	5500	5000	430	391
Journal of Organ Transplantation	2	26400	25900	2063	2023
Journal of Orthopaedic Education	2	5500	5000	430	391
Journal of Pharmaceutical and Medicinal Chemistry	2	16500	16000	1289	1250
Journal of Practical Biochemistry and Biophysics	2	7000	6500	547	508
Journal of Psychiatric Nursing	3	5500	5000	430	391
Journal of Social Welfare and Management	3	7500	7000	586	547
New Indian Journal of Surgery	4	8000	7500	625	586
Ophthalmology and Allied Sciences	2	6000	5500	469	430
Otolaryngology International	2	5500	5000	430	391
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Standard journal article

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