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THE FORGOTTEN COG: ANALYZING PARAMEDICAL STAFFING REQUIREMENT OF CARDIAC CATHETERIZATION LABORATORY: OBSERVATIONS AND RECOMMENDATIONS

Hospital Administration

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ABSTRACT

Introduction: With increase in incidence of cardiac related morbidity, the interventional cardiac catheterization procedures are increasingly performed every year. While the interventional cardiologist forms the bedrock of the multi-disciplinary team in the interventional cardiac catheterization laboratories (CCL), the staffing recommendation for the paramedical staff is often an oversight. **Aim:** This article intends to highlight the staffing pattern of paramedical technicians in the CCL of a tertiary care hospital, analyze their workload and discuss utilization and prevalent guidelines on staffing of paramedical technicians. **Structure And Methodology:** It is a cross sectional and observational study analysing the workload of CCL paramedical staff by Activity Sampling and Time Motion Study. **Observations And Discussion:** The CCL paramedical technicians in this study worked 3637 hours in a year. Among this, 57.93% of the time were spent towards direct patient care activities (CCL procedures), 13.16% on administration and clerical activities. While 17.58% were spent in nonproductive activities like stand-by time and waiting for the patients. The work hours amounted to 82 hour/ week which is significantly more than any international standards. **Conclusion:** The issue of optimization of technically trained paramedical manpower is of paramount importance, as increased work hours lead to burnout and may increase errors in the workplace, which may lead to catastrophic outcomes. Addressing this issue facilitates optimising healthcare staff for attaining high standards of efficiency by minimizing wastage and maximizing efficiency, reduce burnouts and related adverse events and thence, leading to better patient outcomes and improve patient satisfaction.

KEYWORDS

Cardiac Catheterization Laboratories, Staffing pattern, Time Study, Activity Sampling, Hospital Administration.

INTRODUCTION.

Even as we are completing the first quarter of this century, the role of interventional cardiac catheterization laboratories (CCL) is still continuously increasing in bringing down the cardiac mortality and by extension overall mortality. The role of CCL has evolved substantially over the past 30-35 years, ranging from the routine coronary angiographies and percutaneous interventions to more complex percutaneous valve implantation and electrophysiology procedures[1]. In India, the prevalence of coronary heart disease (CHD) has increased from one percent to approximately nine percent in the urban population in past sixty years[2,3]. In 2018 alone, 4,38,351 percutaneous interventions were performed in India utilizing 5,78,164 stents and showing year on year increase of 13.14%[4].

CCL conducts elective, urgent and emergent procedures with increasing patient and procedural complexity, requiring high level of expertise, optimal peri-procedural communication between the healthcare staff and the patient, and seamless flow of information and instructions between the CCL team members[5,6].

While the cardiac interventionist has always been the bedrock of the CCL team. The role, training and staffing pattern of the paramedical staff is often overlooked. The lack of expertise and/or inadequate staffing of the paramedical staff not only increases the procedure time, risks burn-out but may also detrimentally affect the procedure outcome[5,6].

AIM.

To study the staffing pattern of paramedical technicians in the CCL of a tertiary care hospital, analyze their workload and discuss utilization and prevalent guidelines on staffing of paramedical technicians.

MATERIALS AND METHODOLOGY.

(a) Study Design. The study is cross sectional and observational study carried out in a superspecialty hospital with a bed complement of 600. The study was designed to assess the extent and variety of activities carried out by various categories of Paramedical Technicians working in CCL. The data collection was preceded by a pilot study of one month duration to acquire the sample size. The data collection for the main study was done over a period of 12 months.

(b) Sampling method. Non-probability sampling ie, consecutive sampling of Paramedical Technicians working in the CCL and activity sampling of these technicians at the time of study was carried out.

(c) Determination of Sample Size. To determine the productive and non-productive activities of Paramedical Technicians deployed in the CCL, the first 100 observations of activities were recorded. Minimum sample size calculated by the application of below mentioned formula was 226 observations for a standard error of 2.5.

$$\sigma p = \sqrt{pq/n}$$

Where, σp = standard error of proportion; p = percentage of non-productive activities; q = percentage of productive activities; n= number of observation or sample size we wish to determine.

However, in this study, 2016 observations were included to increase the statistical power of the study.

(d) Data collection. The data was collected by an observational study, study of documents, and open-ended interview method of the staff and structured formats for activity sampling of work study. Data was obtained by periodical and instantaneous observation of paramedical technician by a single observer. The activity sampling technique was applied for 24-hour clock period.

(e) The details of activities related to the jobs of various categories of Paramedical Technicians were obtained through interview of the cardiologists and administrative head of the cardiology Department.

(f) The tasks observed were grouped into eight categories. The categories were also classified into productive and non-productive activities. The productive activities encompassed patient care, procedural, post procedural, patient transportation, administrative, clerical, maintaining supply and equipment, housekeeping, patient education and housekeeping activities. Non-productive activities included all activities of personal nature, resting, stand-by time etc.

(g) In addition, time study was also carried out by recording 30 Observations for each procedure to give statistically relevant sample. The paramedical technical staff in our study had an average experience of 12.3 years, hence a rating factor of 100 was applied to all technical staff. A relaxation time of 10% and contingency allowance of 5% was added to the observed/ basic time to arrive at standard time for each procedure. The radiation exposure as ascertained by Atomic Energy Regulatory Board (AERB) guidelines was under limits (annual dose limit = 30 mSv in any single year; 20 mSv/year averaged over 5 consecutive years) and hence, were not considered during this study.

OBSERVATIONS, DISCUSSION AND RECOMMENDATIONS.

(a) The staff works at the Centre from 0830 hr to 1630 hr on full working days and till 1330 hr on half days, ie Wednesdays and Saturdays. The CCL department also caters to all the Cardiac emergencies after the scheduled working hours. 03 technicians are available for emergency duties from 1630 hrs to 0830 hrs on full days

and 1400 hrs to 0830 hrs on half days. On an average each technician performs emergency duty every alternate day.

(b) During the one-year study period, the CCL performed a total of 2691 procedures with 1614 (59.98%) angiographies, 738 (27.42%) percutaneous coronary interventions (PCI), 212 (7.87%) valvoplasty and pacemaker insertion (temporary/permanent) and 128 (4.75%) other complex procedures like device/coil closure, electrophysiologic study and radio frequency ablation (RFA) etc.

(c) Activity Sampling. The cumulative activity sampling of the paramedical staff in CCL is shown in table 1 & Figure 1.

Table 1 : Time Distribution Of Activities Carried By Paramedical Technicians In CCL.

S. No.	Group of Activity	No of Observations	Time spent (in min)
1	Patient Care activity	1169	194.73
2	Administration	114	18.98
3	Education	05	0.8
4	Clerical	265	44.31
5	Housekeeping	07	1.20
6	Maintaining supplies & Equipment	67	11.15
7	Off-station duties	35	5.77
8	Non-productive	354	59.06
	Total	2016	336

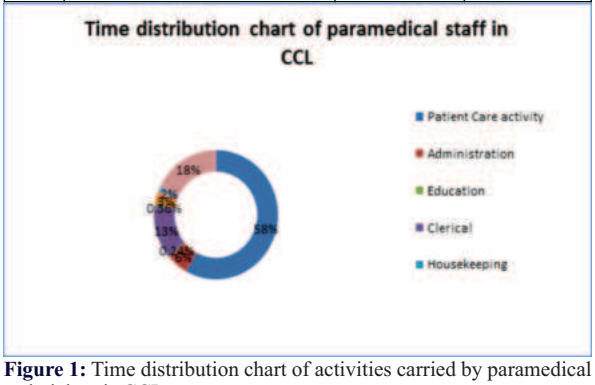


Figure 1: Time distribution chart of activities carried by paramedical technicians in CCL.

(d) It was observed that the paramedical technicians spent **82.42%** (Table 1 – S.No 1 to 7) of their total time on productive activities and **17.58% on non-productive activities**, which is the second highest percentage after patient care activities **(57.93%)** and involved activities like procedure stand by (waiting for patient and supplies). This was largely seen because of multiplicity of activities carried out by single technician, emphasizing the consequence of inadequate number of non-technical support staff *(Ambulance Assistants)*.

(e) Clerical activities which primarily involved making entries in documents of patients, consumed the third highest ie 13.16% of total observation time. The technicians also spent 09% (Ser No 2 & 6) of their times in administration & maintaining supplies. Off-station works like accompanying patient to another department, carrying Unit message to other department, transportation of supplies like collecting clean linen, handing over soiled linen, taking indents to stores and collection of stores issued to the CCL.

(f) Patient education and counseling were primarily performed by the physicians and hence a miniscule amount of time was spent by the paramedical staff on this. Dedicated staff for housekeeping helped in increasing the patient care time of the paramedical staff.

(g) Over- all, the total productive activity of 82.42% in our study is higher than what was observed by other studies, viz., 73.03%, 55.75% to 58.70%[8,9]. Still, 17.58% of time was utilised in non-productive activities, which, if trimmed down further will ensure better optimization in activities towards the patient care areas.

(h) Time motion Study. Also, the time spent by the technician in each procedure (patient care activity) was recorded and the total time spent per year in various procedures is shown in Table 2.

(j) Similarly, Time spent by CCL paramedical staff in non-patient care activities in a year was also calculated (table 3).

Table 2: Time Spent By CCL Paramedical Staff For Various Procedures In CCL.

S. No	Procedure	Number of procedures in one year	Standard time per procedure (in min)	Total time spent in an year (in min)	Total time spent in an year rounded off (in hours)
1	Angiography	1614	50	80700	1345
2	Angioplasty	738	74	54612	911
3	Valvoplasty/ TPI/PPI	212	50	10600	177
4	Device / coil closure	128	92	11776	197
	Total	2691	266	157688	2630

Table 3: Time Spent By CCL Paramedical Staff In Non-patient Care Activities In A Year.

S. No.	Group of Activity	Percentage of time spent	Time spent in 8 hour shift (in min)	Time spent in one year (in min)	Time spent in one year (in hours)
1	Administration	5.65	27.1	8136	135.6
2	Education	0.24	1.2	345.6	5.76
3	Clerical	13.16	63.2	18950.4	315.84
4	Housekeeping	0.36	1.7	518.4	8.64
5	Maintaining supplies & Equipment	3.32	15.9	4780.8	79.68
6	Off-station duties	1.72	8.3	2476.8	41.28
7	Non-productive	17.58	84.4	25315.2	421.92
	Total	42.03	201.7	60523.2	1008.72

(* assuming 300 working days in a year excluding Sunday and closed holidays)

(k) Thus, the total time required by the Cath Lab Technicians to carry out all the activities in a year is as given below:Table 4: Total time spent by CCL paramedical staff in one year(l) Total period of absence due to entitled annual leave -02 months, casual leave- 01 month, daily lunch (01 hr) and tea breaks (30 min), continued medical education/ career progression courses and temporary move due to official requirements is 408 hours. Total technician time spent on the Cath lab activities in a year is **3637** Hrs.

(m) The matrix of staffing, taking into account stipulated working hours, in a week, in various countries is tabulated as under (table 5)[10]. In the present study, we found that the 82-hour work week is almost twice the practiced norms in other developed countries. While this might be a challenge in a resource constrained country like ours but will go a long way to ensure the wellbeing of staff, reduce work burden, increase efficiency in patient care areas and prevent mistakes leading to adverse patient outcome.

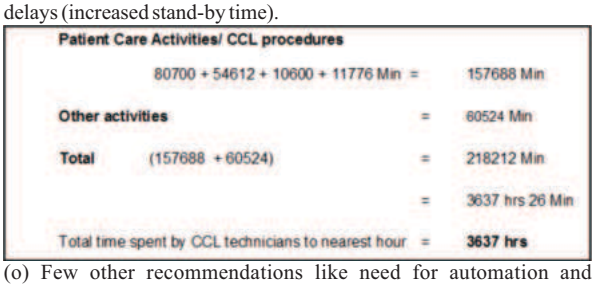
Table 5 : Matrix For Staffing Requirements In CCL

Hours of Working per week	Hours of working per year	Time available (Excluding entitled hours of absence*)	Technician Requirement in CCL (rounded to whole number) to meet 3637 hrs of technician time
82 (In the current study)	4264	3856	1
48 (Switzerland, Thailand)	2496	2088	2
40 (US, Austria, Belgium, New Zealand)	2080	1672	2
32 (France)	1664	1256	3

(*entitled hours of absence include entitled leave, lunch and tea breaks, continued medical education and career progression courses and temporary move)

(n) Optimizing the activities of paramedical staff would involve reducing the amount of non-patient care activities performed by them, which would substantially increase the time available for patient care.

It is recommended that additional non-technical staff (Ambulance Assistants) be posted to take over the administration, reception and other non-productive activities. It is also recommended that inadequate number of support staff leads to multiplicity of activities being carried out by a single technician and consequently leading to delays (increased stand-by time).



Patient Care Activities/ CCL procedures			
	80700 + 54612 + 10600 + 11776 Min	=	157688 Min
Other activities		=	60524 Min
Total	(157688 + 60524)	=	218212 Min
		=	3637 hrs 26 Min
Total time spent by CCL technicians to nearest hour		=	**3637 hrs**

(o) Few other recommendations like need for automation and connecting all the computer terminals through Hospital Information system(HIS) and Radiology information system (RIS), networking, hiring of dedicated Data Entry Operator (DEO), reviewing the charter of duties of non-technical paramedical and support staff (eg Ambulance Asst, lady attendent etc) for multitasking, opportunity for training and also certification for long term skill building and career growth of the paramedical technicians, should be strongly considered.

CONCLUSION

Armed Forces Hospitals are one of the largest non-revenue generating Government Health Organization catering to the medical requirements of a large population of serving personnel's and their dependents. The increased duty times as demonstrated by our study, cause increased burnout and is detrimental to the health of staff. This can also result in adverse patient outcomes due to burn-out related errors.

In view of the multitude of role performed by the skilled manpower and the impact it has on the clinical outcomes, the issue of optimization of technically trained paramedical manpower takes paramount importance. Addressing this issue facilitates effective monitoring of cost of healthcare for attaining high standards of efficiency by minimizing wastage and maximizing efficiency, reduce burnouts and related adverse events and thence, leading to better patient outcomes and improve patient satisfaction.

Abbreviations:

CCL = Interventional Cardiac Catheterization Laboratories; CHD = Coronary Heart Disease; AERB = Atomic Energy Regulatory Board; HIS = Hospital Information System; RIS = Radiology Information System; DEO = Data Entry Operator

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