

Feedback on Experience Acquired In The Management Of Hospital Biomedical Technologies Through Implementation Strategies For The Use Of Radiology Equipment, The Operating Room And Sterilization At Hospital Gabriel Touré In Mali.

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Summary

Goal: making the inventory of using large equipment at the Gabriel Touré Hospital and providing solutions.

Materials and methods: This is a descriptive cross-sectional study using the problem-solving method by the quality approach which took place from December 2013 to June 2014 concerning two departments and 38 users.

Results: out of 38 respondents, two doctors know how to handle the ultrasound machine. 3 agents (7.89%) know how to choose the use constants, the use test is only performed by 20 agents including 11 sterilization and imaging manipulators. 14 officers perform the act poorly, including 5 x-rays. Only 8 officers turn off the equipment after work, 18 do not perform maintenance after use.

Conclusion: The maintenance problem is linked to the lack of supervision and guidance and to the skills gap. An internal reorganization of the maintenance department is necessary.

Keywords: Maintenance, equipment, management, hospital

1 Introduction

Hospital reform is one of the strategic axes of actions to revitalize and reorganize the maintenance sector by relying on administrative and financial management autonomy. Gabriel Touré Hospital, like other public hospitals, is embarking on the path of reform by equipping itself with an administrative and management system allowing the creation of the conditions of excellence required by quality medical activity. [1]. The reconciliation of its health objective consisting in guaranteeing a better quality of care for the whole population and its accounting objective which requires a balance of its accounts, this new statute requires an in-depth reflection on the improvement of the health management system, maintenance of equipment, infrastructure and installations. The hospital is a place of care and training therefore requires that the equipment be kept in working order in order to provide quality service. The technological development of medicine increasingly leads to the use of modern and sophisticated diagnostic and care equipment which requires appropriate use, regular maintenance, repairs and systematic renewal. The Ministry of Health of Mali within the framework of the ten-year health and social development plan PDDSS devotes 2/3 of the investment budget to civil engineering works and equipment. This is to strengthen the extension of health coverage [2]. Hospital maintenance covers all of the hospital technical equipment and installations. The technical installations include: electrical installations, laundry, plumbing, refrigeration, air conditioning, kitchen, medical fluid plants [3].

The equipment consists of conventional laboratory equipment, various hospital equipment and biomedical equipment (x-ray machine, resuscitation, electric scalpel). In general, the problems related to maintenance are characterized by poor knowledge of the equipment by customers resulting in a lack of information on their operation, the rules of good conduct and the risks associated with poor performance of the equipment; lack of

mastery by technicians and operators of equipment use methods; consumables and spare parts are lacking; materials when acquired are not very often with usable technical documentation; the maintenance service is not efficient for various reasons: insufficient tools and equipment, insufficient organization and qualified human resources, unsuitability for new biomedical technologies. 2 The equipment has no value only if they work and if they are used correctly: users know how to handle them correctly; the medical user personnel know their operation and know how to configure them for the desired purpose; users respect forecasts, visits and expert opinions [4]. According to a study carried out by the hospital engineering mission of the public assistance of Marseille hospitals AP / HM February 2001 at the Gabriel Touré hospital, we see by visiting the premises, technical installations and equipment that no maintenance is required. 'is carried out at the Gabriel Touré hospital and that users participate in non-maintenance through their resignation and especially their lack of responsiveness to situations that are sometimes critical in terms of health and safety [5].

The budget review of Gabriel Touré Hospital in 2013 shows capital expenditure in the budget and operating expenses. The appropriations allocated to maintenance amount to around 2% of the operating budget [6]. Currently, the own resources generated at the HGT level from procedures performed on large equipment (medical imaging, operating theater and sterilization unit) amount to around 14% of own revenue [6]. The misuse of equipment including radiology, ultrasound, operating room and sterilization equipment results in frequent breakdowns and long downtimes leading to a revenue deficit on financial forecasts of the hospital [5]. The management of biomedical equipment is problematic, the possible solutions for a better use of biomedical equipment will constitute the cornerstone for the development of this study.

2 Methodology

The large equipment installed in 2 medical technical services of the HGT was selected as the scope of the study. For the final choice of services, the criteria concerning the problems related to time, frequency of occurrence, means necessary to solve the problem as well as the impact of the problem on the functioning of the hospital and the maintenance department have to be considered. The equipment selected is the responsibility of 2 technical services, namely the medical imaging and anesthesia-reanimation service. The surveys were carried out in the cold block A, B, C, the radio section, the echo section and the sterilization section. The equipment concerned was for the cold block, electric scalpels, operating tables, lighting lamps; for the radio section the apelem radiography, the trophy radiography; for the ultrasound section, the ultrasound machine; for the sterilization section, the autoclave, the doll. The study took place in 4 main stages: 1) identification of HGT problems, their prioritization and formulation of the priority problem; 2) specification of the problem; 3) analysis of the causes, research hypotheses, verification of the hypotheses, development of data collection instruments surveys preparation, conduct of the surveys in the field, files examination, analysis of data collected and prioritization of causes and; 4) analysis of solutions, proposal of solutions, prioritization of the solution, implementation of the solution and evaluation of the implementation. For problem solving, the participatory approach was selected. All the players and services were involved, namely management, the management committee, unit heads.

Defining the scope of the study and various actions planning to be carried out were implemented through mutual agreement with the hospital evaluation agency supervising the study. The methodological approach took place in 2 essential phases: the immersion characterized by the analysis of the organization and functioning of Gabriel Touré Hospital from the main functions that compose it; problem solving focusing on the situational analysis allowing the identification of the priority problem, its formulation of the priority problem and its resolution. For the formulation of the problem, reference was made to a maintenance service supervision report in 2002 to highlight a discrepancy due to insufficient staff control over the use of large equipment in general. The supervision carried out by the maintenance team in 2012 showed that concerning the large hospital equipment only 5% were well used while 80% had to be used well with the respect by the staff of all the instructions of use of devices. It can be deduced that there is a problem because the intended level of use of the large equipment has not been reached. The problem raised concerns the use of large equipment in 2012 by the medical staff of the Gabriel Touré Hospital. In order to better specify the problem, an operational definition of its objective was carried out; description of its dimensions; identification of activities on which dimensions shall be applied; determining indicators for each dimension; application of dimensions to activities; identification of the target population. Purpose of the problem: use of the equipment was raised in both the desired situation and the observed situation. Operational definition of the problem purpose: By use of an equipment, we mean all the activities carried out by the medical staff to check the supply voltage of the device, to choose the parameters of use, to carry out use test, load the machine and ensure daily maintenance of the appliance (cleaning and checking the fuel level).

Dimensions of the problem purpose: the various dimensions of equipment used by medical personnel retained with the consent of the members of the maintenance department are: check the supply voltage; the choice of use parameters; the use test; carrying out the act; turning off the device; daily maintenance of the device. Then we had to identify departments activities and the use of the devices which require application of these selected dimensions. We decided with hospital officials to retain medical imaging (radiology and ultrasound), sterilization (puppinel and autoclave) and operating theater (operating tables and lamps) activities. For each of these activities, we checked whether dimensions of equipment use is implemented. These are qualitative indicators that have been used with scales ranging from good to poor handling. These scales make it possible to assess the level of use of handling agents of different services. From the dimensions and measurement indicators formulated, the assessment of the use of equipment by medical staff makes it possible to assess the level of compliance with the rules of good use.

3 Research Results

Out of 38 agents surveyed, 73.68% are health technicians (TS and TSS) and 5.28% are doctors who exclusively handle the ultrasound machine. 3 agents or 7.89% do not choose the constants of use. The choice of constants is not made on the lighting lamp, the table with 66.67% opinions against 33.33% for the ultrasound machine. 20 agents do not perform an equipment use test, i.e. 52.63% of opinions including 6 sterilization equipment handling agents (autoclave and puppinel), 5 medical imaging equipment handling agents (radiotrophy, radio apelem). Lack of information is the main cause for not performing the test with 45% of the opinions of the manipulators. However, 25% of respondents do not perceive the need for the test, especially for radiology manipulators. 42.86% of the shortcomings related to carrying out the act are due to insufficient technical expertise and lack of supervision (Table I). Five manipulator agents of the Apelem radio are having difficulty carrying out the act, which results in the loss of a large number of images. The handling agents are health technicians, 8 agents or 21.05% do not switch off after use (Table II). The trend is more important for medical imaging equipment (radiotrophy and apelem). The reasons given are above all the high frequency of sickness which conditions long-term and intermittent use of the devices. Opinion also leans 50% on ignorance of the need to shut down equipment.

Maintenance will involve cleaning (cleaning and dusting, sheltering with the protective cover) and checking the level of fuel necessary for the operation of the devices. Maintenance requires both a specific technique and particular means by type of equipment. 18 agents do not perform regular maintenance, ie 47.36% (Table III). The lack of regular maintenance is especially glaring on medical imaging equipment (radiotrophy and apelem). The lack of maintenance is due for 55.56% of the opinions to the lack of specialized training and maintenance kit, to which are added bad habits and the limited number of equipment resulting in overuse. However, 11.11% of the agents surveyed attributed the insufficiency to a lack of accountability, monitoring but also to the lack of rigor in the application of good practices.

4 Research Discussion

The choice of constants is made almost entirely by the entire staff. There is a problem with the standardization of constants in order to standardize the data by type of patient and device. The key to minimizing costs and effectively managing large equipment in a healthcare facility lies in identifying the different categories of patients per type of pathology and the consequent choice of constants according to them [6]. This approach depends on the implementation of an appropriate technique for choosing the constants. Such an approach reduces not only reduces but increases the efficiency and reliability of test results and medical procedures. The establishment of standard sheets fixing the standard constants per type of act will already be a step forward in this area. The usability test is not carried out sufficiently, if it is done it is mainly by the handlers of the ultrasound machine, the scalpel and the illumination lamp. The lack of discipline and information added to the bad habit exposes this practice to shortcomings. Added to this are the risks arising from the effects (radioactivity) that may arise from the use in testing of medical imaging equipment [7,8].

Use testing requires more than checking the functionality of the equipment, it shall ensure that the entire necessary equipment is available. The act is poorly carried out by 14 agents out of 38 users of the equipment. Completion of the act is a condition for obtaining a good result and contributes to making substantial savings which may result from the loss of analytical inputs [5]. Power off is not effective. If it is carried out, it is done spontaneously without setting a time limit or the number of patients to be taken care of depending on the productive capacities of the device. The devices in continuous operation are mainly those for medical imaging due to very increased stress and the lack of perception by staff of the need to switch off. Although the maintenance department is responsible for ensuring regular technical monitoring, the operators after use of the equipment must maintain the equipment in good condition (clean and covered), and put it under cover. This falls within the scope of level 1 maintenance which is that of the user [9]. It is noted that the material resources for

maintenance are lacking in addition to the lack of technical skills. Maintenance hitherto neglected in the African healthcare system must be inserted at the heart of the dynamics of hospital management [5,10].

5 Conclusion

The new context of hospitals characterized by organizational and structural changes requires an improvement in the management of biomedical equipment. Maintenance shall be an insurance guarantee against the loss of operation and have a better quality of care. Good use of equipment in addition to the qualified human resources and in sufficient number will be an added value and a capital to be potentiated. The study allowed us to analyze the biomedical maintenance management system, mainly the use of medical imaging devices, the cold operating room, and the sterilization room of Gabriel Touré hospital. We recommend the reorganization of the hospital maintenance department and the implementation of a formal policy for the management of biomedical equipment.

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Table I: Appreciation of the actors implied about the current insufficiencies related to the bad realization of act

Study level	Equipment type	Total number	Categories of deficiencies		
			Lack of training	Insufficient mastery of the technique	Poor condition of the development product
TS	Radio apelem	2	1	1	
TSS	Radio apelem	3	1		2
T. Bio	Radio apelem	1		1	
TS	Lamp Lighting	1		1	
TSS	Autoclave	1	1		
Ing. Bio	Autoclave	1		1	
TS	Puppinel	2	2		
Interne	Echograph	2	1	1	
TS	Scalpels	1		1	
Total		14	6	6	2
Average % of opinions		100	42,86	42,86	14,29

TS: Health technician, TSS: Senior health technician, Tbio: Biomedical technician, Ing Bio: Biomedical Engineer, Interne: intern

Table II: Appreciation of the actors implied about the current insufficiencies related to the absence of setting not under tension

Study level	Equipment type	Total number	Categories of deficiencies	
			High frequency of sickness	Not necessary
TS	Radio Apelem	1	1	
TS	Operator Table	3		3
TSS	Radio Apelem	1	1	
TSS	Radiotrophy	2	2	
TSS	Operator Tables	1		1
TOTAL		8	4	4
Average % of opinions		100	50	50

TS: Health technician, TSS: Senior health technician, Tbio: Biomedical technician

Table III: Appreciation of the actors implied about the current insufficiencies related to the absence of daily maintenance.

Study level	Equipment type	Total number	Categories of deficiencies			
			Lack of accountability	Lack of training and maintenance kit	Bad Habits	Limited number of equipment
Ing. Bio	Autoclave	1		1		
Ing. Bio	Lamp Lighting	1		1		
Ing. Bio	Puppinel	1		1		
Ing. Bio	Radiotrophy	1			1	
T Bio	Radio Apelem	1		1		
TS	Autoclave	1		1		
TS	Scalpels	1		1		
TS	Lamp Lighting	1		1		
TS	Puppinel	1				1

TS	Radio Apelem	2		1	1	
TS	Radiotrophy	1		1		
TS	Operator Tables	1				1
TSS	Puppinel	1		1		
TSS	Radio Apelem	1	1			
TSS	Radiotrophy	3	1		1	1
TOTAL		18	2	10	3	3
Average % of opinions		100,00	11,11	55,56	16,67	16,67

TS: Health technician, TSS: Senior health technician, Tbio: Biomedical technician, Ing Bio: Biomedical Engineer