How Total Quality Management (TQM) Revolutionizes Internal Care Units: Insights from North Lebanon Hospital

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Abstracts: This term paper will answer the question how Total Quality Management (**TQM**) can affect intensive care units (**ICU**) in North Lebanon hospital. To comprehend the impact of Total Quality Management (TQM) on emergency services, the paper will define TQM along with its major roles and stages in business. It will also present the effect of TQM on the operations of healthcare institutes, such as hospitals, with a specific focus on the Intensive Care Unit (ICU). **ICUs** are critical components in modern health care. To improve the performance of **ICU**, a project is decided to be done on well-known hospital in north Lebanon called *NINI HOSPITAL*. Knowledge is the key for this project; therefore, study has been done on the **ICU** unit of *NINI* hospital and several interviews were done with personal in charge by asking different questions pertaining to the quality system of the hospital, challenges faced in the **ICU** and activities conducted in their capacities. SPSS software is used to process and analyse data collected. The conclusion drawn from the assessment of North Lebanon Hospital's ICU underscores the vital role of Total Quality Management in optimizing patient care, evidenced by meticulous attention to theoretical knowledge and practical training, high standards of human interaction, adherence to protocols, and a commitment to continuous improvement, positioning NINI Hospital as a preferred healthcare provider with plans for ISO certification. Solutions and proposals are offered to enhance the quality performance in ICU by gathering data and analysing it and present the instruments that will implement this improvement and what are the potential results of these proposals.

Keywords: Total Quality Management, Intensive Care Units, Commitment, Human Interaction, Patient Care

1. INTRODUCTION

The concept of Total Quality Management (TQM) is a fundamental component of contemporary organizational management, transforming methods for productivity, client satisfaction, and ongoing enhancement. TQM, which is based on ideas that place an emphasis on quality at all levels of operation, reworks organizational procedures and culture to be more in line with the goal of excellence. The coming review of the literature explores the many facets of Total Quality Management (TQM), explaining its definition, importance, guiding principles, goals, and components. Additionally, it examines the significance and implementation of TQM in a variety of settings, including emergency services and medical facilities. The explanation starts with a thorough analysis of TQM's core principles as stated by a number of industry leaders.

All of these definitions—from Deming's support for quality commitment regardless of cost considerations to Joseph Juran's emphasis on "fitness for purpose"—collectively highlight TQM's overarching goal of continuous improvement (1986). The review also discusses the justification for adopting TQM, emphasizing how crucial it is for promoting organizational resilience and customer satisfaction in the cutthroat market of today. Going a step further, the review clarifies the core ideas of TQM, highlighting the necessity of organizational-wide involvement and a dedication to quality. It outlines the goals of Total Quality Management (TQM), explaining how total involvement, quality fulfillment, and management commitment are combined. Moreover, it breaks down the fundamental elements of Total Quality Management (TQM), summarizing the focus on customer focus, error prevention, continuous improvement, and managerial engagement.

Broadening its scope, the review delves into specific areas where Total Quality Management (TQM) demonstrates its transformative capabilities. TQM becomes essential in emergency services to guarantee critical interventions are completed quickly, accurately, and with human reliability. Comparably, through systematic quality enhancement initiatives, TQM in healthcare institutions catalyzes improvements in patient care. TQM principles can be integrated into healthcare practices to improve patient outcomes and service efficacy, according to authors like Morris (2000), Donabedian (1980), and Crosby (1979).

The paper then moves on to the topic of intensive care units (ICUs), where it discusses the complex relationships between process parameters, staff development, and quality indicators. It emphasizes the critical role that highly skilled staff, painstaking procedures, and strict quality standards play in guaranteeing the best possible patient care. It also highlights the critical importance of safety and quality in ICU operations.

Furthermore, the paper emphasizes how critical it is for ICU settings to continuously improve, pushing for a change in strategy to emphasize patient-centric care and good family communication. ICUs can improve patient satisfaction and family support in addition to improving medical outcomes by promoting a culture of openness, cooperation, and continuous learning.

In summary, this research acts as a thorough road map, assisting readers in navigating the complex terrain of Total Quality Management (TQM) and its applications in various industries. Total Quality Management (TQM) is a powerful tool that promotes organizational excellence, customer satisfaction, and continuous improvement. Its practical applications in emergency services and healthcare are supported by its fundamental principles.

2. LITTERATURE REVIEW

2.1. T.Q.M

2.1.1. What is TQM

TQM stands for Total Quality Management. *TQM* is a way to move toward the improving the efficiency and flexibility of an entire business organization, it evolves every department, every activity, and every employee in every level of the organization (Miller, 1996). TQM assure that strategic and long-term decisions about quality are being adopted and assure that the management focuses on prevention rather than assessment (Hellsten et al., 2000).

TQM provides overall concept that promotes continuous improvement in the organization. Its values stress on having a systematic, incorporated, and reliable organization wide perspective including everyone and everything (García-Alcaraz et al., 2021). It primarily focuses on total “customer satisfaction” on both internal and external, which its consequences on market profits, competitive position, and capital productivity (Nguyen et al., 2019).

Productivity is also affected by the outcome of each employee; in which each one owns the results of his effort. Thus, a single person or a team will take responsibility for any mistake and will be liable for improving the performance of the business process (Ruales Guzmán, 2019). Therefore, the participation between all company’s personals in creating and offering quality products has become essential to manifest TQM successfully.

TQM was defined several times by different business figures in 1980s and 1990s. **Collard**, **Sivyer** and **Deloitte** (1990) defined **TQM** as: *“a cost-effective system for integrating the continuous quality improvement efforts of people at all levels in an organization to deliver products and services which ensure customer satisfaction”.*

Joseph Juran (1986) defined **TQM** *“as fitness for purpose”* and advised *“balancing marginal costs and benefits of quality improvement”.* **Deming** (1986) believed *“that management should commit to quality without counting cost”.*

2.1.2. Why TQM

When a company offers products and services with poor quality to customers, it is 100% certain that this company will suffer a big loss in profits and in market shares. All companies around the world now understand the important impact of quality; therefore, quality is integrated into business strategy, and the success in today modern market seems to depend on the key factor which is involving **TQM** in business functions (Hietschold et al., 2014).

Business experts mention that **TQM** goes beyond **ISO 9000** and **QS 9000**, ***TQM*** objective is to dedicate all functional activities for the purpose of satisfying the customer, and **TQM** has no other objective than this (Prabhu et al., 2000).

2.1.3. Principal of TQM

The idea of **TQM** is making all employees at every level participate in supporting the well-being of the company. **TQM** techniques can be applied throughout the company, whether in finance, marketing, designing and production. TQM must start from the top management level to successfully promote business efficiency (Rogo et al., 2017).

2.1.4. Objective of TQM

Total means that everyone related to the company is involved in continuous and constant improvement, in which all employees are stimulated to become more creative and attributive.

Quality means that customers' expectations and requirements are achieved fully which is the primary and essential objective for the organization to keep surviving and growing in field of business.

Management means that decision makers and executives are fully committed to the company's objectives.

2.1.5. Elements of TQM

The various elements of TQM are (Prajogo et al., 2004):

- **Focus on customer:** The company must regularly check on customer's attitudes, and include both internal and external customers ideas
- **Do it right at first time:** Try to avoid redoing the work, reducing defective units
- **Quality is an attitude:** The operation of everyone in the company must be committed to quality.
- **Constant improvement:** Continuous improvement means continuous growth in the company.
- **Training and educating staff:** Skilled workers means achieving goals in different jobs, besides knowing the principles of TQM means a new style of working.
- **Involvement of top management:** The program won't succeed without the involvement of senior managers.
- **Good place to work:** TQM will not work in environment of fear, work environment must be smooth where everyone is cooperating (boss and staff).
- **Always inform the staff:** Team briefing improves communication.

2.1.6. Importance of TQM in Emergency Services

Speed and accuracy are two key aspects to accomplish any emergency service. The quality of any emergency service composed of different quality characteristics which all are important and must take into consideration (Aburayya, 2020).

Three factors that impact **TQM** in emergency services:

- Managing teams

- Participative management
- Continuous process improvement

Also, the cost management is very important to maintain the continuity of quality emergency services, and important to control a nation's health care expenditure for example.

Emergency services (fire brigade, ambulance, intensive care) depend on human actions, and to avoid human errors at any level is critical and vital. When dealing with emergency people it makes it hard to deal with the problem or the situation. Thus, the priority is to be given for human reliability with a 100% set of goal (Talib et al., 2011).

In emergency services either emphasizing on accuracy (zero error) or emphasizing on urgency (zero delay).

2.1.7. Knowledge of TQM in Health Care Institutes

The interest of quality in health care institutes started to emerge in the early 1980s, in which new methods of development and tools increased in providing quality health care. Many well-known authors in world of business see health care like any other service provided by an organization (hospitals, clinics) to customers (patients). **Deming** (1982) proposed his famous cycle **Plan-Do-Check-Act** to enable organizations to come up with solutions for their problems, by focusing on improving the process which improves the productivity at the lowest cost. **Crosby** (1979) stated that **TQM** depends mostly on people (staff, workers) that run the programs, and stressed that the work should be built on understanding, motivation, and commitment of the employees. **Donabedian** (1980) focused on the components of quality health care and stated that his three concepts:

- **Technical care:** The importance of introducing technology of medicine into the management of health care.
- **Interpersonal relationship:** The interaction between patients and practitioners is essential.
- **Environment:** The importance of Facilities, ambiance, temperature, food…etc.

Morris (2000) defined **TQM** as a buildup system, in which the quality of each phase must be completed and guaranteed. By doing this approach the service's effectiveness of each unit, department, activity, and every single personal at every level increase. **Morris** stated that high quality in health care must not has a high cost anymore, and emphasize on the importance of knowledge in improvement, in system and in process; without knowledge the organization will fall.

Hendricks (1997) noticed that there is a need to introduce new models for professional health education in **TQM**, and the necessity of health care to initiate an interdisciplinary education. To improve the quality of health care, the work must be down from upper levels towards the lower levels. Leaders in health profession must use the best available knowledge in **TQM** and apply wide training to make the health workers implement **TQM** effectively.

2.2. I.C.U

2.2.1. Role of Intensive Care Unit (ICU)

ICUs in modern health care are critical and vital components in health care institutes; it is a specialized sector of the hospital that provides for critically ill patients with comprehensive and continuous treatments. **ICU** holds patients from emergency center, patients from surgical wards, patients from operation room, and patients from other facilities. **ICU** function is simple even though its practice is difficult and complex; the professional workers in **ICU** provide the patients with intensive monitoring and treatment 24/7 [6]. Admission into **ICU** is accepted when:

- Critically ill and unstable patients who require an intensive level of care.

- Patients who need to be monitored closely and require emergency intercessions.
- Patients who are critically unstable, and don't have much chance for recovering.
- Patients who are not expected to survive, which requires the approval of the director of **ICU** program.

ICU in hospitals need a dedicated and homogenous team that consist of a wide range of specialties that include pharmacy, nursing, respiratory therapy, surgery, paediatrics, and anaesthesiology.

2.2.2. Quality Indicators in ICU

Safety: Separation between quality and safety is difficult when apply those two concepts in medical care [8]. Medical professionals in early stages focused on clinical management of patient care, and now they turned their attention towards implementing safe patient care. **Patient safety** is defined as the absence of any associated injury to patient when conducting treatment, this concept is created to take actions to avoid causing **errors**. These errors are mistakes made during the process of treatment, which might cause harm to patients. Mistakes occur when plans of action fails, which means the result of an action fails *(error of commission).* Also, mistakes occur when not using the proper action plans, which mean action is not taken at all *(error of omission)*. Indirect errors known as **Incident** occur by unexpected events or situations that lead to unintended harm or damage to the patient, another known term in **ICU** is **Adverse Event** which is a medical interaction that results in an injury (Jawad et al., 2021).

Personnel Development: It requires highly trained personnel to deliver high quality intensive care to patients. Those personnel must show high levels of medical skills, and wide capability in dealing with modern technological equipment in proper ways.

Staff in **ICU** is the main cause of errors (human error) that occur during the process of treatment as mentioned previously. Multidisciplinary approach and have reduced drastically the medication errors, which involves dedicated **ICU** workers, nurses, pharmacist, and therapists. **ICU** staffs are either physician trainees or full-time workers whose responsibility in providing emergency treatment in **ICU** only.

Training is a must in this critical domain of work, it is essential to keep and upgrade the skills of **ICU** staff [8]. Staff should be trained in advanced management and **ACLS** *(Advanced Cardiac Life Support)* training, also **FCCS/BASIC** critical training is recommended in **ICU**.

Lack of staffing in **ICU** has negative consequences such as delays in weaning patients, increase in treatment errors, increase in period of stay and increase in infection rates [8]. In order to provide equal care for each patient in **ICU** and at the same time not to overload nurse with work, the gold standard in staffing is having one nurse for each patient [8]. Always take into consideration the number of patients and the type of care needed to assign the adequate staffing (Breyer et al., 2019).

2.2.3. Process Parameters

To provide an optimum treatment at **ICU** its process must take into consideration two aspects **Quality** and **safety** [8]. As mentioned in Patient safety section there is two types of errors, error of commission and error of omission. Error of **omission** represents the **Quality** of the level of action being taken, and error of **commission** represents the **Safety** of action being taken. Quality in care is defined as the achieving goals without exceeding the financial resources; therefore, quality can be analytically expressed as a ratio of **Standard Achieved** / **Expected Standard**. Quality is monitored on **structural** level that includes facilities design, staffing, patient ratio and capacity. Second it is monitored on **process** level that involves care delivery training and implementation guidelines. Third is monitored on **outcome**s which are rates of infection, mortalities, and other measures (Nouira, 2018).

The 20 Fundamental Quality Indicators for Critical Care developed by the Spanish Society of Intensive & Critical Care and Coronary Units (SEMICYUC) are:

1. Compliance with hand hygiene protocols
2. Providing information to families of patients in the ICU
3. Appropriate sedation
4. Appropriate pain management
5. EGDT in sepsis
6. Early enteral nutrition
7. Prophylaxis for GI bleeds in those undergoing invasive mechanical ventilation
8. Inappropriate transfusion of packed cells
9. Semi recumbent position for patients on invasive mechanical ventilation
10. Ventilator associated pneumonia
11. Prevention of thromboembolism
12. Early administration of acetyl salicylic acid in acute coronary syndrome
13. Early reperfusion therapy in STEMI
14. Monitoring ICP in severe traumatic brain injury with CT findings
15. Surgical intervention in traumatic brain injury with subdural and/or epidural haematoma
16. Protocols and implementation of withholding / withdrawing life support
17. Organ donation
18. Perceived Quality Survey at discharge from ICU
19. Presence of an intensivist in the ICU
20. Maintaining an Adverse Events Register

2.2.4. Improvement of ICU

In order to improve the performance of **ICU**, a change in the mentality has to done from concentrating on individual performance into a systematic approach that emphasize on improving the operation of **ICU** process (McMillan, 2007). Improvement of quality in intensive care units (ICU's) or improvement of clinical care requires the exact accurate measurement of the key dimensions of health care quality and acting based on the results of these measurements. Families, data analysts, clinicians, and administrators all have important roles to play. The objective is to design an approach that enables managers to measure family or patient satisfaction data, so that these data can be translated into health care quality improvement initiatives.

The quality system dimensions in an ICU can be summarized in the following chart:

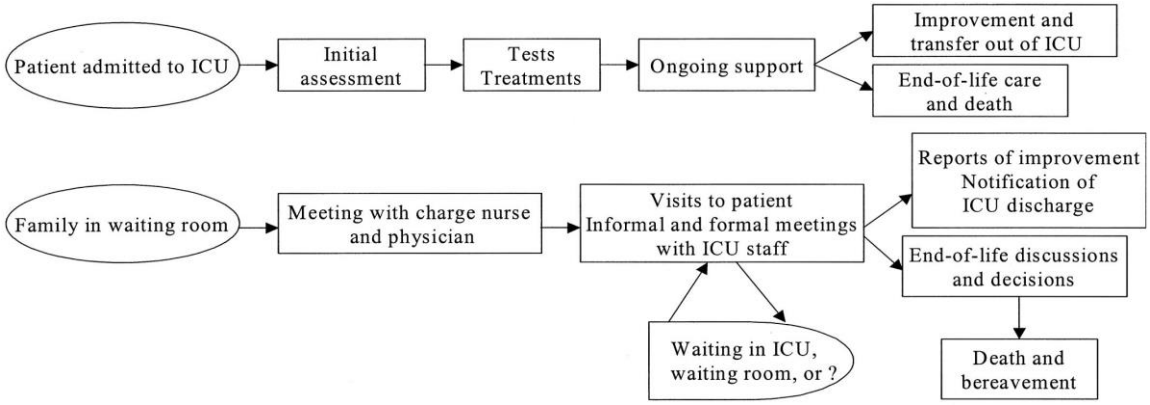


Figure 1. Quality system dimensions in ICU

The two main dimensions of quality in an ICU as seen above are:

1- the patient and the direct medical service provided: Test treatments cannot be initiated without initial assessment in prior because this could lead to increasing the effects of human error done at the primary stage at the patients' arrival. If the treatment of the patient requires time, emotional support to the patient from both the medical team and the family must be provided and allowed.

2- communication, coordination and updating provided for family members or emotionally related people to the patient: family members must constantly be updated about the initiation, results or termination of initial assessment and treatment process provided to the patient this is done by One person of the medical staff, preferably the doctor performing the direct operation on the patient due to the instinctive trust family members build into him/her. Only one person should carry this responsibility to prevent the cause of any confusion to the family members.

What is as important as the technical medical capabilities of the ICU and its doctors is its ability to provide ongoing support during the patients stay. This support comes both from the medical staff itself and from the family. The medical staff should keep the patient updated on his status in the most ethical way possible even if the staff must sometimes lie to patients. The family members should be allowed access to the patients as much as possible as long as it does not affect the patients' health.

3. BACKGROUND OF THE STUDY

Before starting to investigate about the targeted hospital, background knowledge is essential in order to understand better the upcoming work environment (levels of ICU), factors affecting ICU and to ask better and precise questions.

3.1. ICU Levels and Types

ICU level varies from one hospital to another, the difference in the level exist in the structure, staff experience and service; these variations are due to economic factors [9]. The ICU level of service depends on the population being served (Rich, average and poor). Any hospitals have the choice to separate the ICU's patients on gender and age category [9]. Large hospitals can have multiple ICU units, while medium and small ones will have only one ICU unit.

Three levels of ICU

- Level I: ICU that provides total care treatment for wide range of syndromes, which need continuous availability of advanced equipment and skilled ICU staff. Besides the support of other services such as pharmacy, respiratory therapy, and social services.

- Level II: ICU that provides total care treatment but doesn't have the required resources (equipment) to provide treatment for specific types of people such as cardio surgery and trauma.

- Level III: ICU of hospitals that provide the basic stabilizing critical care and have limited resources. These hospitals must transfer the ill patients to other qualified hospitals that have level I or II of care treatment.

Two types of ICU:

- Open system: even though nurses, doctors, respiratory therapists are ICU base; they might have other responsibility towards patients outside ICU.

- Closed system: Treatment is provided by ICU based team of nurses, doctors, and respiratory therapists.

3.2. Factors to Take in Consideration

Two factors that affect the attitude of ICU staff toward TQM

1. Exterior Factors
    a. Cultural factors
    b. National factors
    c. Social & Economical factors
2. Interior Factors
    a. Knowledge
    b. Training

In this project, the focus will be on factor that relates to human action (knowledge & training), especially that the interior factor according to literature review shows that is has a much more significant impact on TQM in ICU.

ICU is an emergency service that depends on human actions, which can hold human mistakes (Errors of commission and Errors of omissions). Therefore, any enhancement in ICU quality is an enhancement of workers skills, where here comes the role of Knowledge and training.

TQM exists in all hospitals as a THEORY, but in application it requires creating or improving Knowledge, training, and exposure to this concept, to receive the output which is the reaction (attitude) of ICU workers towards TQM.

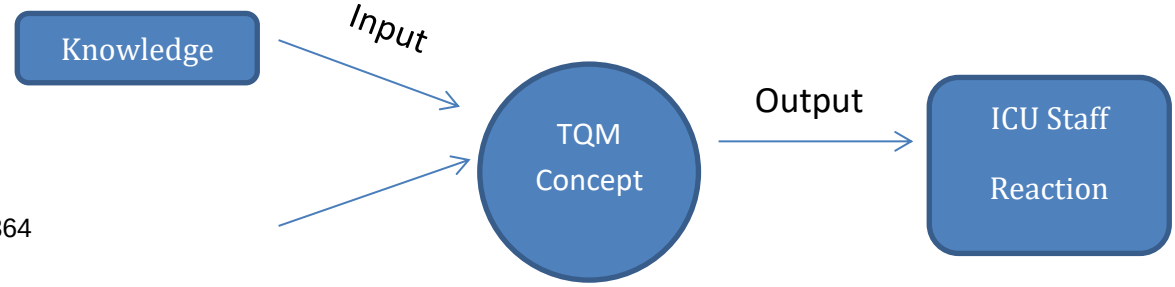


Figure 2. ICU staff factors

3.3. Quality in ICU

ICU is a critical service and as mentioned in previous sector human intervention or human factor has a vital role in providing this service at high value [10]. This service is based on rapid decisions and actions made by ICU staff. Studies showed that in 24 hours, one patient requires ***178 individual interactions***. Thus, quality in this system is essential, because ***"the cost of non-quality in any organization is more expensive than investing in quality"*** [10].

In order to classify the service of ICU of having quality in it, must meet the following points:

- ICU must provide patients the required care by highly skilled and discipline staff.
- ICU should possess the necessary and appropriate medical equipment.
- Critical decisions related to patients' situations must be shared between ICU staff, patients and family.
- Quality of care must be continuous during critical situations and during recovering.

4. EMPIRICAL PART

This section will present the methodology or research method used during population sampling, data collection process and statistical analysis; to obtain a clear view of how the system design (process) in ICU works, and spot on the role of TQM in it.

After conducting a literature review on the role of Total Quality Management (TQM) in ICUs and researching the historical knowledge of TQM in healthcare, it is evident that TQM is closely associated with human factors more than any other factor. This part will explore this relationship at NINI HOSPITAL and pose relevant questions. The methodology will include:

- Methodology
    - Research Location
    - Permission of Acceptance
    - Background Knowledge
    - Instrument
    - Data Collection
    - Questions and Questionnaire
    - Observation
    - Data & Observation Analysis

4.1. Objective

As mentioned in the first part of the project, TQM is related to human factor more than any other factor. Therefore, there will be a relationship between ***Knowledge about quality (TQM)*** and the ***application of this knowledge by ICU staff.***

4.2. Research Location

The institute of health care to be researched and questioned is ***NINI HOSPITAL,*** which is considered one of the top-quality hospitals that provide health treatment in north Lebanon.

4.3. Background Knowledge

4.3.1. Data Collection

Every data related to demographic distribution at the hospital, number of department distribution, and number of employees will be collected.

4.3.2. Questions

To determine the relationship between the knowledge of TQM and the attitude of ICU workers towards TQM, the best instrument to explore is by questioning, which is a set of questions asked in different levels for different aspects.

- First set of questions is related to knowledge about ICU at NINI hospital.
    - What is ICU in your hospital?
    - Difference between ICU and other units?
    - How visits occur in ICU?
    - When patient goes into ICU?
    - When patient leaves ICU?
    - Relationship between patient and ICU staff?
- Second set of questions is related to the operation process in ICU
    - What is responsibility of medical staff in ICU (overview)?
    - What are nursing tasks?
        - Patient / Nurse ratio
        - Shift period
        - Responsibilities
    - How technical tasks are handled?
        - Service provided
        - Responsibility
    - How are cleaning tasks handled?
        - Importance
        - Guidelines
- Third question is related to TQM knowledge for NINI’s staff.
- Fourth question is related to method of applying knowledge in the field of work

4.3.3. Observation

During questioning the staff workers, an observation will be made about ICU structure Design and services provided in it.

- Observation of ICU position in hospital and its design
- Security in ICU
  - Guideline
  - Utilities
- Description of patient area in ICU
  - Space
  - Floor type
  - Bed positioning
  - Lighting
- Positioning of equipment
- Backup service in ICU

4.3.4. Questionnaire

A questionnaire will be done at NINI hospital which will include the opinions of the medical staff, nurses, patients and families of patients and the questions were scaled by a five point “Likert Scale” with these choices:

1 - Does not apply at all, 2 - Applies very little, 3 - Applies somewhat, 4 - largely Applies, 5 - Applies greatly.

Also, there is certain questionnaire that has direct answers; thus, it will be done using the scale of **YES or NO**

5. RESULTS

NINI hospital is one 10 hospitals (public and privets) that exist in Tripoli, which is a high-density area in north Lebanon, with a population approximately reach 600 000 living in 24 Km^2.

5.1. Descriptive Results

Data of services provided by the hospital

	Ground Floor	1st Floor	2nd Floor	3rd Floor	4th Floor	5th Floor
NINI HOSPITAL	Radiology Department	One Day Operation Rooms	Birth Operation Rooms	General Surgery	Cardiac	Sewing
	Laboratory	HR	Physiotherapy	Recovery	ICU	Library
	Accounting	Clinic children	Neonate		Nutrition	Conference Hall
	Cafeteria	Purchases				Exterior Clinics
	Blood Bank	Chemotherapy				
	Maternity					

Table 1. Services Provided

Data of NINI Demographics of Patients

	Male	Female	Total

Number	52	82	132
Percentage	37.88 %	62.12%	100%

Table 2. Distribution by Gender

	0-10 years	11-20 years	21-30 years	31-40 years	41-50 years	50-60 years	Over 60 years	Total
Number	22	10	8	7	21	30	34	132
Percentage	16.66%	7.57%	6.06%	5.3%	15.9%	22.7%	25.75%	100%

Table 3. Distribution by Age
Data of job types and number of employees

Job Type	Number of Employees
Administration & Auxiliary	50
Physiotherapy	1
Nurses	114
Pharmacists	9
Assistant Pharmacists	3
Anaesthesia Technician	7
X-ray Technician	12
Lab. Technician	20
Respiratory Technician	19
Dietician	15
Social Worker	0
TOTAL	250

Table 4. Distribution of Job Types
Number of Beds per department

Department/Unit	Number of Beds
ENT (Ear, Nose, Throat)	11
Burn Unit	0
ICU	22
Urology	0
Neonate	22
General Surgery	11

Paediatrics	22
Cardiac	22
Emergency	11
Internal Medicine	11
Occupancy Rate	80%
TOTAL	**132**

Table 5. Number of Beds for Each Department

5.2. Observation

5.2.1. Position and design

ICU is easily accessible to all departments of the hospital, that which holds all different patients that come from different departments such as recovery rooms, surgical rooms, and emergency rooms. The guide stated that the siting of ICU department help minimizes the distance crossed by the patients, the wide corridor is important in order to handle the high flow of patient and fits the moving beds. The floor is ceramic in order to prevent any slipping of patients and staff, and the lighting bulbs are all fluorescent white for heating and cost purposes.

5.2.2. Security

During observation in ICU and in the whole hospital security is essential, high staffing in ICU ensure security specially when needing permission to enter the patient area. The hospital policy force strict guidelines on visitors to ICU, also security measures include video surveillance and access keys.

5.2.3. Patient area

ICU is fully air conditioned and in case of the breakdown of the system, windows are opened. In ICU unit there is 11 rooms, in each room there is 2 beds, the guide stated that the beds are positioned in ways to maximize patient privacy; no beds are facing each other, but are located next to each other, and each bed is covered with curtains for privacy reasons.

The area or space for each bed is approximately 13 m^2, besides extra space for waiting areas of visitors, nurses' rooms, storage area and toilet.

5.2.4. Equipment

Every patient has its own cardiac arrest trolley next to him/her in case of any cardiac failure, and for every 6 beds there is one extra cardiac arrest trolley used just in case of failure of the main one. Also, respiratory equipment is located next to each patient. Blood refrigerators are available in ICU, to have fast access in case of any emergency.

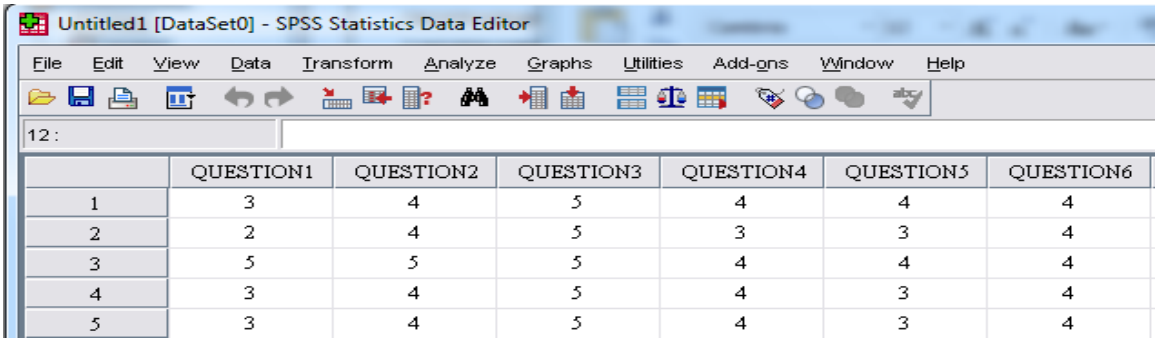
5.2.5. Backup Service

NINI hospital is equipped with two backup big generators which are stand by when a blackout occurs, also NINI hospital allocated a UPS room in order to prevent any dysfunction in the operation of surgery equipment when a blackout occurs in surgery rooms.

5.3. Questionnaire Results Processing

5.3.1. Results related to "Patients" Questionnaire

Using SPSS, a statistical software, the questionnaire results can be analysed and obtain the perfect result for each question.



	QUESTION1	QUESTION2	QUESTION3	QUESTION4	QUESTION5	QUESTION6
1	3	4	5	4	4	4
2	2	4	5	3	3	4
3	5	5	5	4	4	4
4	3	4	5	4	3	4
5	3	4	5	4	3	4

Figure 3. Patient's SPSS

Table 6. Statistics Table for "Patients" Questionnaire

Statistics

		QUESTION1	QUESTION2	QUESTION3	QUESTION4	QUESTION5	QUESTION 6
N	Valid	5	5	5	5	5	5
	Missing	0	0	0	0	0	0
Mean		3.20	4.20	5.00	3.80	4.20	4.00
Median		3.00	4.00	5.00	4.00	4.00	4.00
Mode		3	4	5	4	4[a]	4
Std. Deviation		1.095	.447	.000	.447	.837	.000
Variance		1.200	.200	.000	.200	.700	.000
Range		3	1	0	1	2	0
Minimum		2	4	5	3	3	4
Maximum		5	5	5	4	5	4
Sum		16	21	25	19	21	20

a. Multiple modes exist. The smallest value is shown

Table 7. Question 1 details- Patients

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	2	1	20.0	20.0	20.0
	3	3	60.0	60.0	80.0
	5	1	20.0	20.0	100.0
	Total	5	100.0	100.0	

Table 8. Question 2 details- Patients

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	4	4	80.0	80.0	80.0
	5	1	20.0	20.0	100.0
	Total	5	100.0	100.0	

Table 9. Question 3 details- Patients

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	5	5	100.0	100.0	100.0

Table 10. Question 4 details- Patients

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	3	1	20.0	20.0	20.0
	4	4	80.0	80.0	100.0
	Total	5	100.0	100.0	

Table 11. Question 5 details- Patients

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	3	1	20.0	20.0	20.0
	4	2	40.0	40.0	60.0
	5	2	40.0	40.0	100.0
	Total	5	100.0	100.0	

Table 12. Question 6 details- Patients

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	4	5	100.0	100.0	100.0

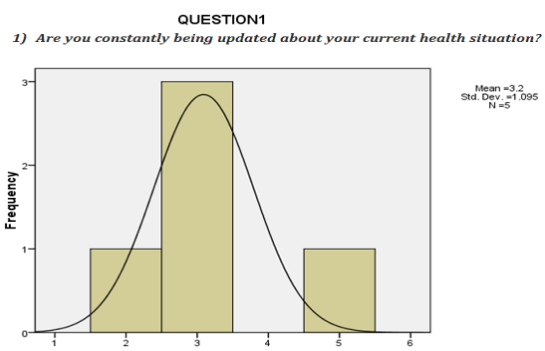


Figure 4. Normal Distribution- Q1- Patients

Mean is 3.2 ≈ 3 ➔ average answer is "Applies somewhat".

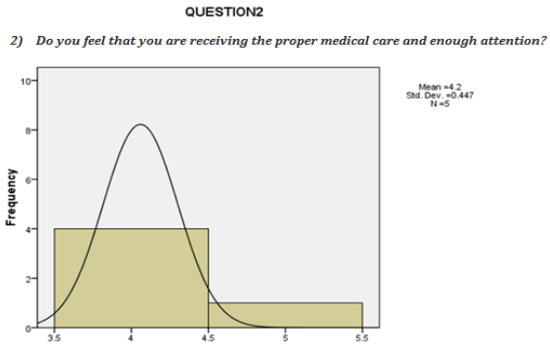


Figure 5. Normal Distribution- Q2- Patients

Mean is 4.2 ≈ 4 ➔ average answer is "Apply to a large extent"

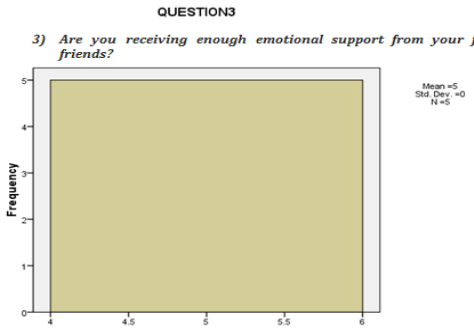


Figure 6. Normal Distribution- Q3- Patients
Mean is 3 ➔ average answer is "Applies somewhat".

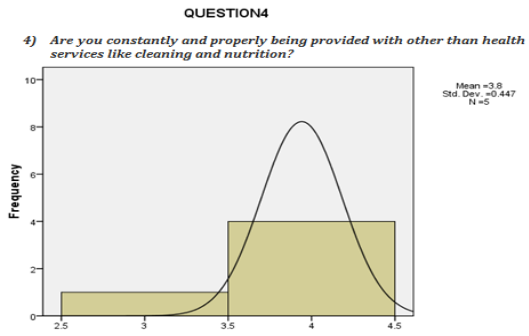


Figure 7. Normal Distribution- Q4- Patients
Mean is 3.8 ≈ 4 ➔ average answer is "Apply to a large extent"

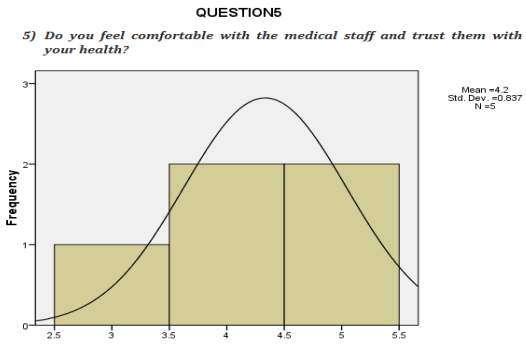


Figure 8. Normal Distribution- Q5- Patients
Mean is 4.2 ≈ 4 ➔ average answer is "Apply to a large extent".

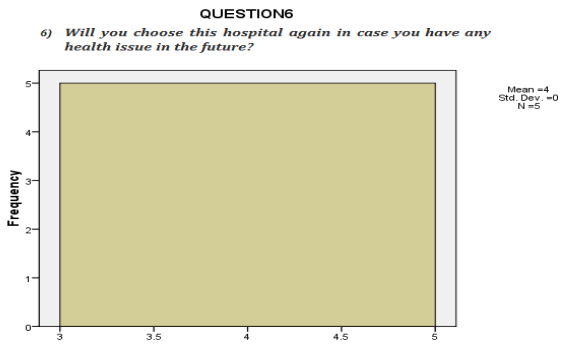
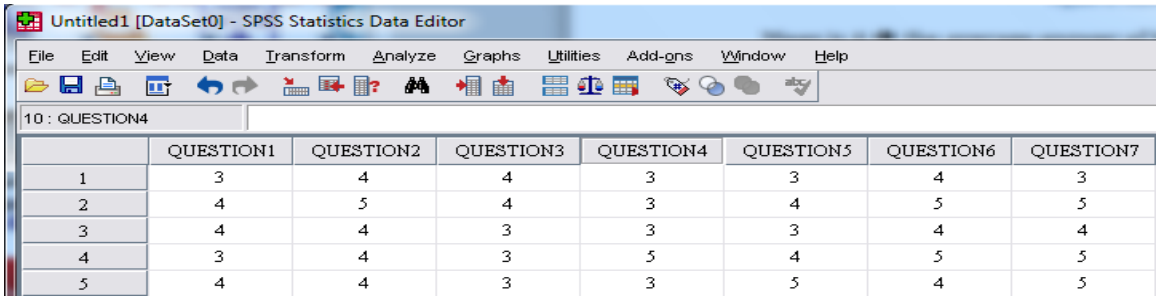


Figure 9. Normal Distribution- Q6- Patients
Mean is 4 ➔ average answer is "Apply to a large extent"

5.3.2. Results Related to "Medical Staff" Questionnaire



	QUESTION1	QUESTION2	QUESTION3	QUESTION4	QUESTION5	QUESTION6	QUESTION7
1	3	4	4	3	3	4	3
2	4	5	4	3	4	5	5
3	4	4	3	3	3	4	4
4	3	4	3	5	4	5	5
5	4	4	3	3	5	4	5

Figure 10. Medical staff's SPSS

Table 13. Statistics Table for "Medical Staff (MS)" Questionnaire

Statistics

		QUESTIO1	QUESTIO2	QUESTION3	QUESTION4	QUESTIO5	QUESTIO6	QUESTIO7
N	Valid	5	5	5	5	5	5	5
	Missing	5	5	5	5	5	5	5
Mean		3.60	4.20	3.40	3.40	3.80	4.40	4.40
Median		4.00	4.00	3.00	3.00	4.00	4.00	5.00
Mode		4	4	3	3	3[a]	4	5
Std. Deviation		.548	.447	.548	.894	.837	.548	.894
Variance		.300	.200	.300	.800	.700	.300	.800
Range		1	1	1	2	2	1	2
Minimum		3	4	3	3	3	4	3
Maximum		4	5	4	5	5	5	5
Sum		18	21	17	17	19	22	22

a. Multiple modes exist. The smallest value is shown

Table 14. Question 1 details- MS

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	3	2	20.0	40.0	40.0
	4	3	30.0	60.0	100.0
	Total	5	50.0	100.0	
Missing	System	5	50.0		
Total		10	100.0		

Table 15. Question 2 details- MS

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	4	4	40.0	80.0	80.0
	5	1	10.0	20.0	100.0
	Total	5	50.0	100.0	
Missing	System	5	50.0		
Total		10	100.0		

Table 16. Question 3 details- MS

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	3	3	30.0	60.0	60.0
	4	2	20.0	40.0	100.0
	Total	5	50.0	100.0	
Missing	System	5	50.0		
Total		10	100.0		

Table 17. Question 4 details- MS

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	3	4	40.0	80.0	80.0
	5	1	10.0	20.0	100.0
	Total	5	50.0	100.0	
Missing	System	5	50.0		
Total		10	100.0		

Table 18. Question 5 details- MS

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	3	2	20.0	40.0	40.0
	4	2	20.0	40.0	80.0
	5	1	10.0	20.0	100.0
	Total	5	50.0	100.0	
Missing	System	5	50.0		
Total		10	100.0		

Table 19. Question 7 details- MS

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	3	1	10.0	20.0	20.0
	4	1	10.0	20.0	40.0
	5	3	30.0	60.0	100.0
	Total	5	50.0	100.0	
Missing	System	5	50.0		
Total		10	100.0		

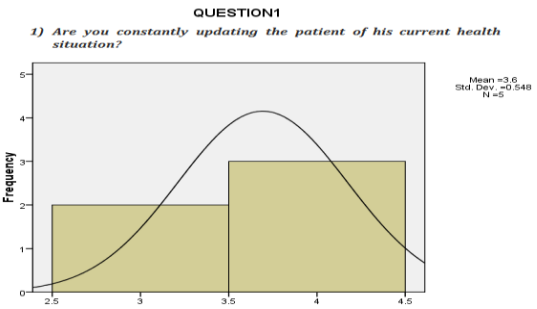


Figure 11. Normal Distribution of Q1- MS
Mean is 3.6 ≈ 4 ➔ average answer is "Apply to a large extent.

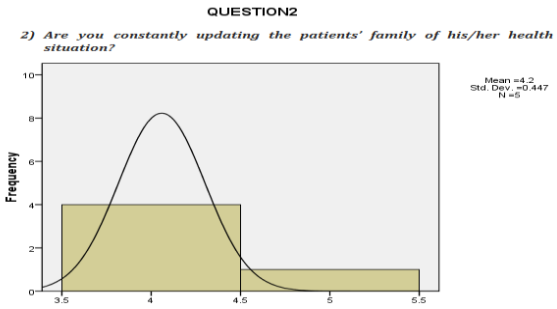


Figure 12. Normal Distribution of Q2- MS
Mean is 4.2 ≈ 4 ➔ average answer is "Apply to a large extent"

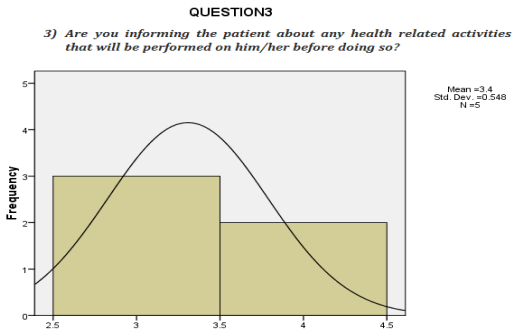


Figure 13. Normal Distribution of Q3- MS
Mean is 3.4 ≈ 3 ➔ the average answer is "Applies Somewhat".

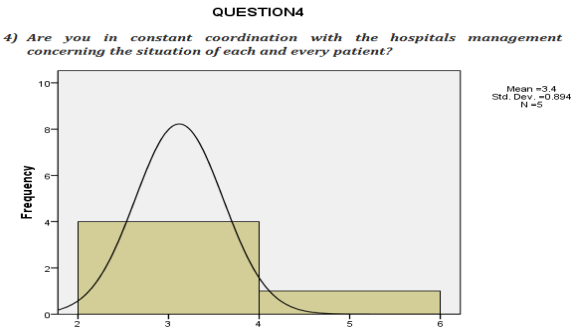


Figure 14. Normal Distribution of Q4- MS
Mean is 3.4 ≈ 3 ➔ the average answer is "Applies Somewhat".

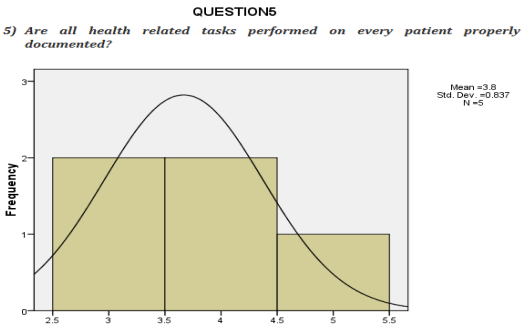


Figure 15. Normal Distribution of Q5- MS
Mean is 3.8 ≈ 4 ➔ the average answer is "Apply to a large extent".

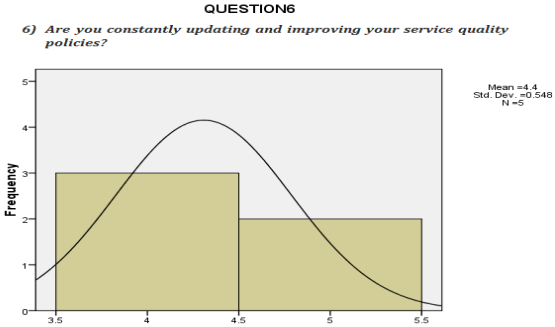


Figure16. Normal Distribution of Q6- MS
Mean is 4.4 ≈ 4 ➔ the average answer is "Apply to a large extent"

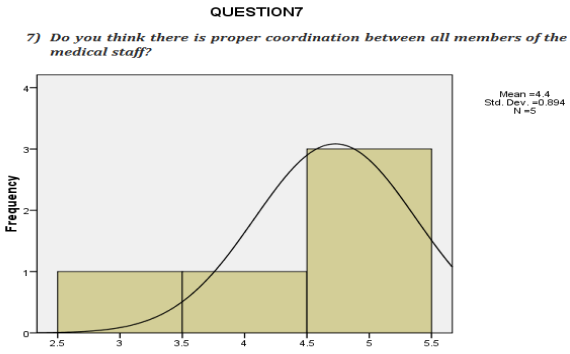
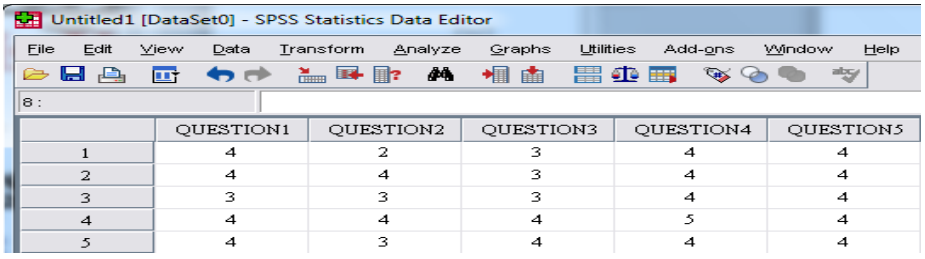


Figure 17. Normal Distribution of Q7- MS
Mean is 4.4 ≈ 4 ➔ the average answer of this Question 7 is "Apply to a large extent"

5.3.3. Results related to "Patient's Families" Questionnaire



	QUESTION1	QUESTION2	QUESTION3	QUESTION4	QUESTION5
1	4	2	3	4	4
2	4	4	3	4	4
3	3	3	3	4	4
4	4	4	4	5	4
5	4	3	4	4	4

Figure 18. Patients Families' SPSS

Table 20. Statistics Table for "Patients Families (PF)" Questionnaire

Statistics

		QUESTION1	QUESTION2	QUESTION3	QUESTION4	QUESTION5
N	Valid	5	5	5	5	5
	Missing	0	0	0	0	0
Mean		3.80	3.20	3.40	4.20	4.00
Median		4.00	3.00	3.00	4.00	4.00
Mode		4	3[a]	3	4	4
Std. Deviation		.447	.837	.548	.447	.000
Variance		.200	.700	.300	.200	.000
Range		1	2	1	1	0
Minimum		3	2	3	4	4
Maximum		4	4	4	5	4
Sum		19	16	17	21	20

a. Multiple modes exist. The smallest value is shown

Table 21. Question 1 details- PF

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	3	1	20.0	20.0	20.0
	4	4	80.0	80.0	100.0
	Total	5	100.0	100.0	

Table 22. Question 2 details- PF

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	2	1	20.0	20.0	20.0
	3	2	40.0	40.0	60.0
	4	2	40.0	40.0	100.0
	Total	5	100.0	100.0	

Table 23. Question 3 details- PF

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	3	3	60.0	60.0	60.0
	4	2	40.0	40.0	100.0
	Total	5	100.0	100.0	

Table 24. Question 4 details- PF

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	4	4	80.0	80.0	80.0
	5	1	20.0	20.0	100.0
	Total	5	100.0	100.0	

Table 25. Question 5 details- PF

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	4	5	100.0	100.0	100.0

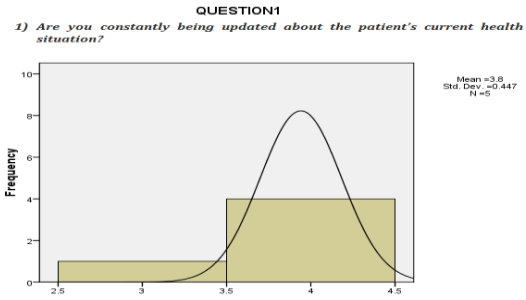


Figure19. Normal Distribution of Q1- PF
Mean is 3.8 ≈ 4 ➔ the average is "Apply to a large extent".

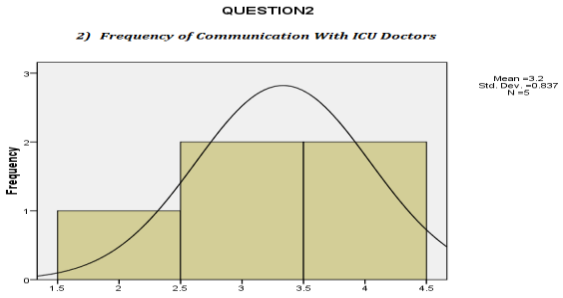


Figure 20. Normal Distribution of Q2- PF
Mean is 3.2 ≈ 3 ➔ the average answer is "Applies Somewhat"

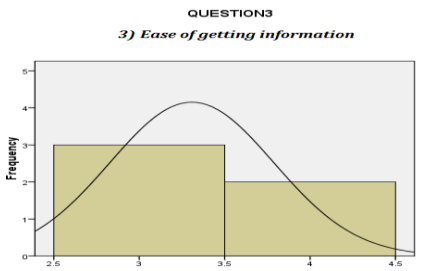


Figure 21. Normal Distribution of Q3- PF
Mean is 3.4 ≈ 3 ➔ the average answer is "Applies Somewhat".

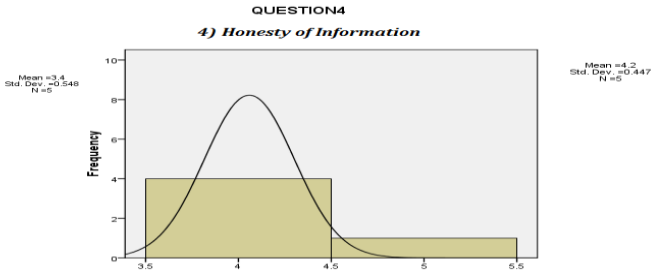


Figure 22. Normal Distribution of Q4- PF
Mean is 4.2 ≈ 4 ➔ the average answer is "Apply to a large extent"

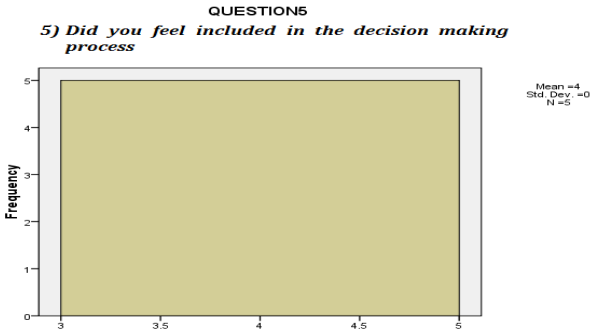
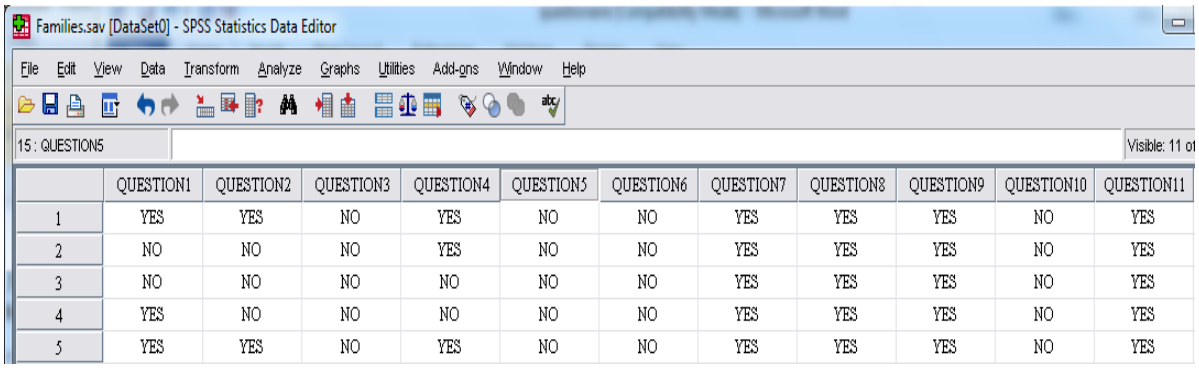


Figure 23. Normal Distribution of Q5- PF
Mean is 4 ➔ the average answer of this Question 5 is "Apply to a large extent"

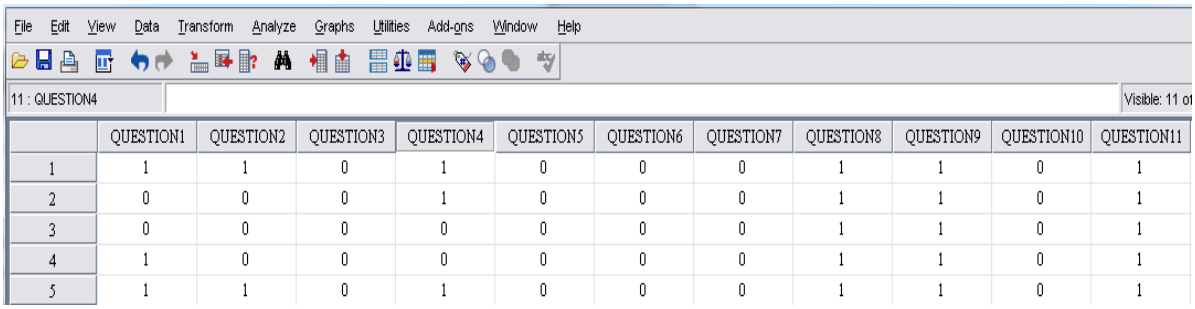
5.3.4. Results related to "Nurses" Questionnaire



	QUESTION1	QUESTION2	QUESTION3	QUESTION4	QUESTION5	QUESTION6	QUESTION7	QUESTION8	QUESTION9	QUESTION10	QUESTION11
1	YES	YES	NO	YES	NO	NO	YES	YES	YES	NO	YES
2	NO	NO	NO	YES	NO	NO	YES	YES	YES	NO	YES
3	NO	NO	NO	NO	NO	NO	YES	YES	YES	NO	YES
4	YES	NO	NO	NO	NO	NO	YES	YES	YES	NO	YES
5	YES	YES	NO	YES	NO	NO	YES	YES	YES	NO	YES

Figure 24. Nurses' SPSS 1

In order to obtain statistical table and normal distribution of this data, the String answers need to be transferred to numbers. **Yes = 1 & No = 0**



	QUESTION1	QUESTION2	QUESTION3	QUESTION4	QUESTION5	QUESTION6	QUESTION7	QUESTION8	QUESTION9	QUESTION10	QUESTION11
1	1	1	0	1	0	0	0	1	1	0	1
2	0	0	0	1	0	0	0	1	1	0	1
3	0	0	0	0	0	0	0	1	1	0	1
4	1	0	0	0	0	0	0	1	1	0	1
5	1	1	0	1	0	0	0	1	1	0	1

Figure 25. Nurses' SPSS 2

Statistics

		QUESTION1	QUESTION2	QUESTION3	QUESTION4	QUESTION5	QUESTION6	QUESTION7	QUESTION8	QUESTION10	QUESTION9	QUESTION11
N	Valid	5	5	5	5	5	5	5	5	5	5	5
	Missing	0	0	0	0	0	0	0	0	0	0	0
Mean		.60	.40	.00	.60	.00	.00	1.00	1.00	.00	1.00	1.00
Median		1.00	.00	.00	1.00	.00	.00	1.00	1.00	.00	1.00	1.00
Mode		1	0	0	1	0	0	1	1	0	1	1
Std. Deviation		.548	.548	.000	.548	.000	.000	.000	.000	.000	.000	.000
Variance		.300	.300	.000	.300	.000	.000	.000	.000	.000	.000	.000
Range		1	1	0	1	0	0	0	0	0	0	0
Minimum		0	0	0	0	0	0	1	1	0	1	1
Maximum		1	1	0	1	0	0	1	1	0	1	1
Sum		3	2	0	3	0	0	5	5	0	5	5

Figure 26. Nurses' SPSS 3

Table 26. Question 1 details- Nurses

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	0	2	40.0	40.0	40.0
	1	3	60.0	60.0	100.0
	Total	5	100.0	100.0	

Table 27. Question 2 details- Nurses

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	0	3	60.0	60.0	60.0
	1	2	40.0	40.0	100.0
	Total	5	100.0	100.0	

Table 28. Question 3 details- Nurses

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	0	5	100.0	100.0	100.0

Table 29. Question 4 details- Nurses

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	0	2	40.0	40.0	40.0
	1	3	60.0	60.0	100.0
	Total	5	100.0	100.0	

Table 30. Question 5 details- Nurses

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	0	5	100.0	100.0	100.0

Table 31. Question 6 details- Nurses

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	0	5	100.0	100.0	100.0

Table 32. Question 7 details- Nurses

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	1	5	100.0	100.0	100.0

Table 33. Question 8 details- Nurses

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	1	5	100.0	100.0	100.0

Table 34. Question 9 details- Nurses

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	1	5	100.0	100.0	100.0

Table 35. Question 10 details- Nurses

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	0	5	100.0	100.0	100.0

Table 36. Question 11 details- Nurses

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	1	5	100.0	100.0	100.0

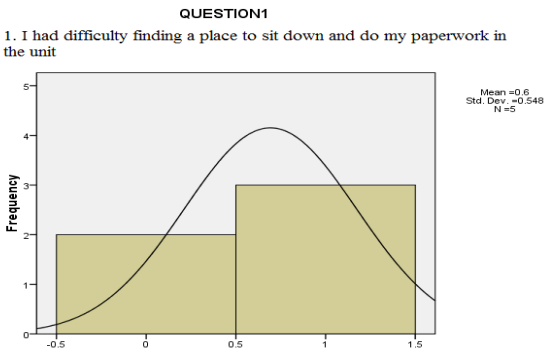


Figure 27. Normal Distribution of Q1- Nurses
Mean is 0.6 ≈ 1➔average answer is “YES”.

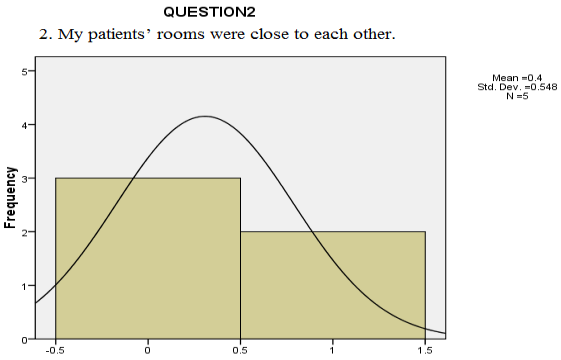


Figure 28. Normal Distribution of Q2- Nurses
Mean is 0.4 ≈ 0➔ average answer is “NO”

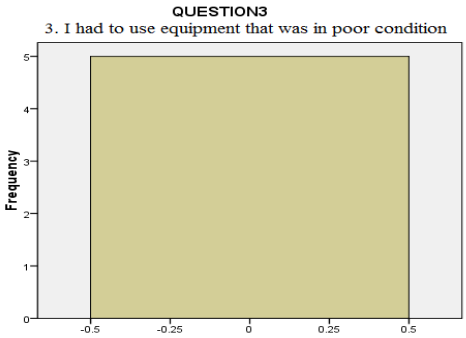


Figure 29. Normal Distribution of Q3- Nurses
Mean is 0➔average answer is “NO”.

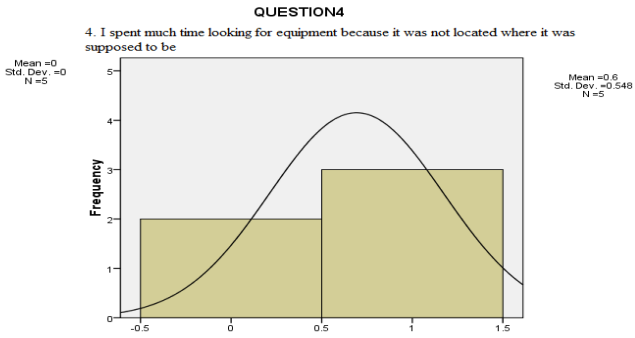


Figure 30. Normal Distribution of Q4- Nurses
Mean is 0.6 ≈ 1➔average answer is “YES”

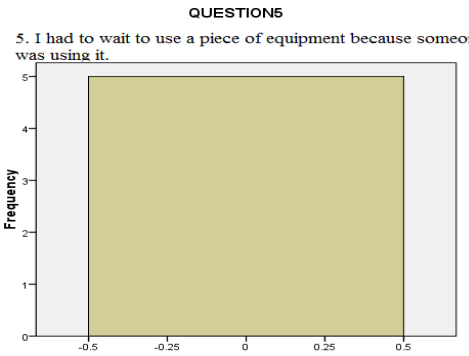


Figure 31. Normal Distribution of Q5- Nurses
Mean is 0➔average answer is “NO”.

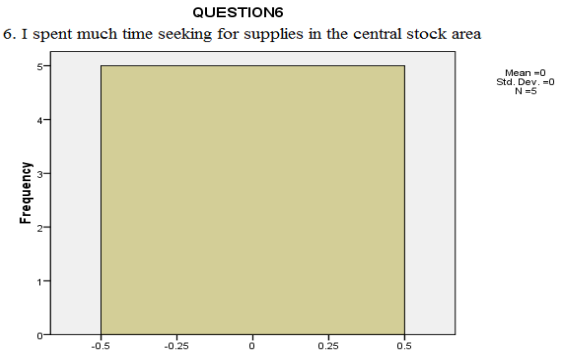


Figure 32. Normal Distribution of Q6- Nurses
Mean is 0➔average answer is “NO”

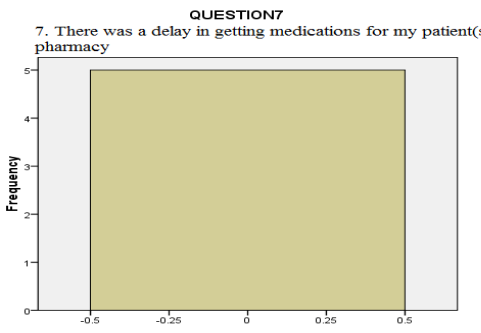


Figure 33. Normal Distribution of Q7- Nurses
Mean is 0➔average answer is “NO”.

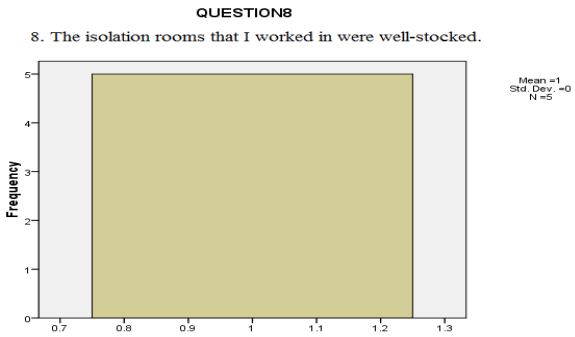


Figure 34. Normal Distribution of Q8- Nurses
Mean is 1➔average answer is “YES”

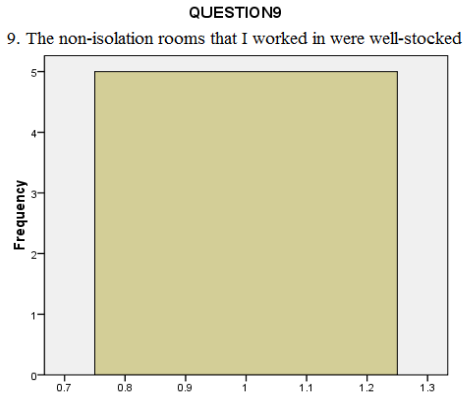


Figure 35. Normal Distribution Q9- Nurses
Mean is 1➔average answer is “YES”.

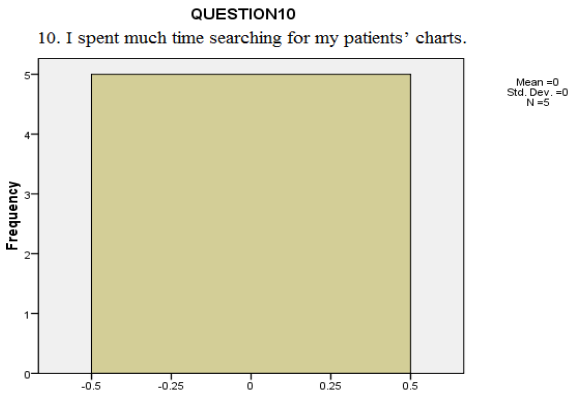


Figure 36. Normal Distribution of Q10- Nurses
Mean is 0➔average answer is “NO”

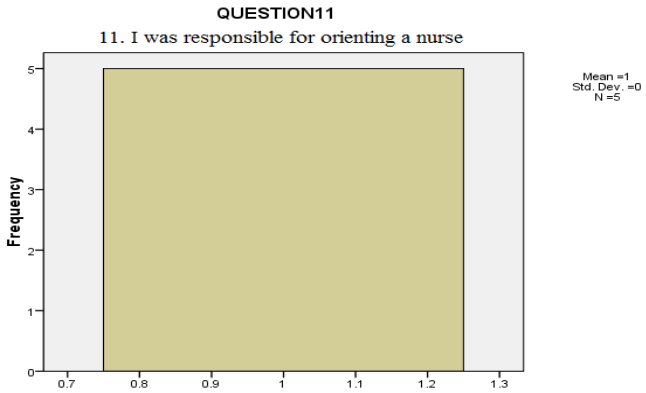


Figure 37. Normal Distribution of Q11- Nurses
Mean is 1➔ the average answer to this Question 9 is “YES”

5.4. Questionnaire Results Analysis

5.4.1. Patient Category

When it comes to the point of view of Patients about the service received whether physically or morally at NINI hospital. The mean answers to the questions are presented below:

1) Are you constantly being updated about your current health situation? *Applies somewhat*

2) Do you feel that you are receiving the proper medical care and enough attention? *Apply to a large extent*

3) Are you receiving enough emotional support from your family and friends? *Applies somewhat*

4) Are you constantly and properly being provided with other than health services like cleaning and nutrition? *Apply to a large extent*

5) Do you feel comfortable with the medical staff and trust them with your health? *Apply to a large extent*

6) Will you choose this hospital again in case you have any health issue in the future? *Apply to a large extent*

When it comes to the High quality of treatment and care provided, the patients declare that it is applied at large extent, while the Moral support is applied somewhat. In overall the Patients are satisfied with the service provided in NINI Hospital, especially when the Answer to question 6 is applied to large extent.

5.4.2. Nurse Category

When it comes to the point of view of Nurses about the operation process at NINI hospital, whether the Nurses are facing difficulties during their jobs or not, which is a result of (layout design, access to equipment…).

1. I had difficulty finding a place to sit down and do my paperwork in the unit. YES
2. My patients' rooms were close to each other. NO
3. I had to use equipment that was in poor condition. NO
4. I spent much time looking for equipment because it was not located where it was supposed to be. YES
5. I had to wait to use a piece of equipment because someone else was using it. NO
6. I spent much time seeking for supplies in the central stock area. NO
7. There was a delay in getting medications for my patient(s) from pharmacy. NO
8. The isolation rooms that I worked in were well-stocked. YES
9. The non-isolation rooms that I worked in were well-stocked. YES
10. I spent much time searching for my patients' charts. NO
11. I was responsible for orienting a nurse. YES

When it comes to the stocks, NINI has a good stock management with an accessing to them. Nurses can reach for stocks directly, in which each room is well stocked, and there is no delay to provide patients with medicine, beside the equipment seems to be always in good shape and available for all nurses without waiting, but it seems there is a problem in placing it back into place which cause problem for other nurses to find them in their right place. On the other hand, it seems that the tasks of each nurse are not located beside each other; the patients' rooms are not allocated close to each other. As for training all nurses has been trained by other nurses, and they are training new nurses.

5.4.3. Patient's Families Category

When it comes to the point of view of families' patients about the information that they get whether is easy or not and whether it is honest or not. Besides how much they are included in decision making.

1) Are you constantly being updated about the patient's current health situation? *Apply to a large extent*

2) Frequency of Communication with ICU Doctors. *Applies Somewhat*

3) Ease of getting information. *Applies Somewhat*

4) Honesty of Information. *Apply to a large extent*

5) Did you feel included in the decision-making process. *Apply to a large extent*

Families are receiving update about their patients' constantly and keeping them informed about their situation, and involving them always in taking critical decision. NINI hospital deliver honest information no matter what they are, and due to intensive work in ICU, the communication between families and ICU is somewhat established. Over all NINI hospital relationship with families of patients is strong and the provided information is honest and frequent.

5.4.4. Medical Staff Category

*1)*Are you constantly updating the patient of his current health situation? *Apply to a large extent*

2)Are you constantly updating the patients' family of his/her health situation? *Apply to a large extent*

3)Are you informing the patient about any health related activities that will be performed on him/her before doing so? *Applies Somewhat*

4)Are you in constant coordination with the hospitals management concerning the situation of each and every patient? *Applies Somewhat*

5)Are all health related tasks performed on every patient properly documented? *Apply to a large extent*

6)Are you constantly updating and improving your service quality policies? *Apply to a large extent*

7)Do you think there is proper coordination between all members of the medical staff? *Apply to a large extent*

Most important thing is that NINI's medical staff show high coordination between its members, and the hospital is always updating and improving the quality of its service.

CONCLUSION

After obtaining all the information about the hospital and observing its structure and its operation in ICU. A deduction can be made that TQM is applied on knowledge and practical levels, which means on theoretical and on training levels. The quality of ICU service depends at most on human interaction beside other factors (equipment, structure). Protocols and guidelines are being followed at NINI's hospitals by its staff. Besides the structure, design and components of ICU are well handled. ICU staff is dedicated to the ethics of the job, and well prepared to handle every situation with right decision, since the mortality percentage are within the acceptable range. NINI hospital is succeeding in providing quality service, because the concept of TQM exists in its different levels, from Executives directors down the nurses. Everyone is involved in taking decision and proposing new ideas to improve the quality of the service. When knowing that NINI hospital's reputation in Tripoli is well spoken for, and it is preferred over other hospital, it means that the clients (patients) are satisfied, which means that NINI's service is reaching the appropriate quality. TQM is essential in the implementation of ICU, and vital for increasing quality in health care institutions with lower cost.

The questionnaire results show that NINI hospital and its ICU is providing good quality service on physically and emotionally, and patients are satisfied and welling to choose this hospital again. Also, according to medical staff and nurses a high coordination between all the members exist, and the presence of stock and resources is available all the time with high amounts and good shape, therefore the quality of the service based on Time and material used is high. NINI hospital is honest in providing information to the families no matter what, so they can get involved in taking decision for the patients, and communication between families, patients and medical staff, nurses always exist. NINI is one of the top hospitals in North Lebanon that applies TQM in its ICU operations, and it is preparing itself to be audited by ISO, to get the certificate next year.

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