2.0 REVIEW OF LITERATURE

2.1 Background of the Study
Nutrition services are an integral aspect of patient care. The basic knowledge of nutrition should give health care professionals the ability to identify potential nutrition problems and realize when it is critical to refer patients to dietitians for comprehensive nutrition services. In the management of patients’ health care, nutrition screening, nutritional assessment, counselling and referrals are very essential. Today, cost containment pressures, healthcare management reorganizations, aging, demographic shifts, and services have changed the consulting role of dietetic professionals. Nutrition services must be provided by a sufficient number of qualified personnel under competent supervision. Nutrition services in hospitals are one of the most important hospital supportive services contributing to the recovery of health through scientifically prepared diets; educating the patients attending the hospitals for treatment regarding use and utility of different foods and balanced diets (Saroj, 1989).

In hospitals, good nutritional practice must encompass the diverse needs of individual patients. Local assessment of the dietary needs of each hospital population is fundamental for successful menu planning and appropriate food provision. For patients who are assessed to be 'nutritionally vulnerable', good nutrition means the provision of small, energy and nutrient-dense meals with frequent snacks to address the well recognised problems of poor appetite and risk of under-nutrition. However, there are also a significant proportion of patients who may be classified as 'nutritionally well' and whose nutritional needs do not differ from that of the general population. The accepted advice for these people is a healthy balanced diet that is characterised by low fat, salt and sugar foods and the inclusion of at least 5 portions of fruit and vegetables a day plus a higher proportion of starchy foods including high fibre foods. Hospitals should encourage promotion of healthy eating for those individuals, including staff and visitors who would benefit from a healthy balanced diet. This is the challenge, but one that can be met through clear communication and coordinated actions between all those involved in the
food chain including input from the patients themselves. This will be central to the success of the wider nutritional care of patients (Walker and Higginson, 2000).

Nutrition services within health care systems have become increasingly important and significant. Scientific methods based on a standardized nutrition care process and consistent standardized language can guide nutrition practitioner’s clinical judgments, critical thinking process, and document information linking nutrition care to patient outcomes (Smith and Lewis, 2004). Unfortunately, this systematic approach is mostly absent in dietetic practice in hospitals in India, especially outside of metro cities. According to Gupta (1998), there are a number of functional responsibilities of the dietetic department such as selection and purchase of foods in a close working relationship with purchase department, receipt and storage of food items, preparation and distribution of food, maintenance of cleanliness and hygiene, dishwashing in a proper way, coordinating with the medical and nursing staff, sensing and influencing patients regarding the importance of food in the treatment process and so on. It is in this context that dietitians need an in-depth knowledge of nutrition, in addition to the managerial ability, to organize his/her staff and their work so as to produce the best possible results, at the least possible costs.

2.1.1 Nutrition Services Environment
Ford and Fairchild (1990) have described some basic elements for nutrition services environment in hospitals. These are:

− A departmental statement of mission or purpose and a strategic plan for delivery of services congruent with the mission, that can be changed as needed in response to adjustments in either the internal environment or the external environment, or both.
− Nutritional standards of practice customized to meet the needs, resources and milieu of the department.
− Written, up-to-date policies and procedures to guide major responsibilities such as screening and nutritional status assessment, care planning, documentation, nutritional counselling, consultations and responsiveness to nutritional needs of patients.
- A method and tool for screening patients to identify efficiently those at nutritional risk and to set priorities for nutritional care services and a system of documentation that facilitates both communication and data retrieval.
- A method for determining patient acuity levels as a basis for setting clinical priorities and managing both time and resources.
- An observable and measurable system for tracking productivity, especially of professional staff members.
- Appropriate and effective staffing patterns and maximizing the potential of each dietetic team member.
- Criteria based performance standards to serve as the basis for competent practice, performance appraisal and professional development.
- An evaluation system to assess and monitor compliance with mandated regulations of government, healthcare agencies and commissions. An environment in which personnel are committed to the mission statement and strategic plan, kept informed, supported with recognition and reward systems and empowered to take responsibility for the quality of services provided.

2.1.2 Dietetic Department and Its Role

The dietetic department mainly serves the patient needs in terms of therapeutic diets, diet counselling and special feeds. The dietary service is one of the most supporting services of the hospital unlike any other support service. The objective of a diet service is to make provision for clean, hygienic and nutritious diet for the indoor patients as per their nutritional requirement. Dietary department of the hospital caters to the needs of all admitted patients by providing major meals including breakfast, lunch, evening tea and dinner, in the best possible hygienic conditions. The dietetic department does procurement, cooking and distribution of food under maximum supervision by the supervisory staff. The dietetic department provides meals to indoor patients in General wards as well as Paying wards. Procurement, storage and cooking is done in the main kitchen under the supervision of qualified Dietitians. The meals provided include Normal, Soft, Liquid, Salt restricted, Diabetic, Low Protein, Special diets and other Therapeutic diets. Diet being a therapy, diet counselling in this regard plays a major role.
in advising patients regarding diet in the presence of their attendants or individually, according to the patient’s nutritional assessment, food habit and therapeutic nutritional needs. Dietetic departments in hospitals also provide training by providing internship to postgraduate students in Dietetics. Anthropometric measurements and bio-chemical assessment are also done for patients to assess their nutritional status. The dietary service can be provided by in house provision or by out sourcing (Das, 2011).

In view of the importance of nutrition services for patients, DGHS (1989) has suggested recommendations for various staff required by a hospital dietetic department (Table 2.1) and the desirable qualifications for dietetic staff (Table 2.2).

| Table 2.1: Suggested Staff Requirement for Hospital Dietetic Departments by DGHS (1989) |
|-----------------------------------------------|-----------------------------------------------|
| **Staff**                              | **Number of Beds and Number of Staff required** |
|                                         | (100)           | (200) | (300) | (500) | (750 & above) |
| Chief dietitian                        | -               | -     | -     | -     | 1              |
| Senior dietitian                       | -               | -     | -     | 1     | 1              |
| Dietitian                             | -               | -     | 1     | 1     | 1              |
| Assistant dietitian                    | 1               | 1     | 2     | 4     | 6              |
| Steward/Supervisor                     | -               | 1     | 1     | 2     | 2              |
| Storekeeper                            | 1               | 1     | 1     | 1     | 1              |
| Assistant storekeeper                  | -               | -     | -     | 1     | 1              |
| Clerk/Typist                           | -               | -     | 1     | 1     | 1              |
| Head cook                              | 1               | 1     | 1     | 2     | 2              |
| Cooks                                  | 4               | 6     | 8     | 10    | 16             |
| Bearers                                | 6               | 14    | 20    | 28    | 32             |
| Attendants(masalchis, helpers, cleaners)| 4               | 5     | 7     | 10    | 12             |
Table 2.2: Suggested Qualification of Dietetic Staff (DGHS, 1989)

<table>
<thead>
<tr>
<th>Post</th>
<th>Qualifications &amp; Experience required</th>
</tr>
</thead>
</table>
| Chief Dietitian       | M.Sc. Foods and Nutrition/ Food Service Management & Dietetics/Institutional Management and Dietetics or Diploma in Dietetics  
Minimum of 10 years experience as a dietitian in a hospital with 300 beds or above |
| Senior dietitian      | M. Sc Foods and Nutrition/ Food Service Management and Dietetics/ Institutional Management and Dietetics or Diploma in Dietetics  
Minimum of 5 years experience as a dietitian in a hospital with 300 beds or above |
| Dietitian             | M.Sc. Foods and Nutrition/ Food Service Management & Dietetics/Institutional Management and Dietetics or Diploma in Dietetics  
Minimum 6 months internship in hospital dietetic department or B.Sc Home Science in hospital dietetics department or  
B.Sc. Home Science with 4 years experience in hospital dietetics department |
| Assistant dietitian   | Diploma in Dietetics Or B.Sc Home Science with minimum of 1 year experience in a hospital dietetics department. |
| Steward/ Supervisor   | Science graduate with 2 years experience in Food Service                                               |

2.2 PHYSICAL FACILITIES AND LAYOUT OF HOSPITAL NUTRITION SERVICES

A food service facility must be designed with both space and function in mind. To determine the best workspace for hospital nutrition services, physical arrangement, different areas of storage, preparation, service areas in the dining rooms and special support areas, must have special design features.

2.2.1 Kitchen layout and other areas

The kitchen layout for hospital kitchens must be considered according to its functions. The kitchens should be designed in relation to the quantity of food needed for patients. The planning for an efficient layout is the assembly line, effective continuous workflow from receiving, storage, issuing, preparing, cooking and serving the food. In the receiving area, the outside door should be 6-foot single or regular double size to admit hand trucks, large cartons and any piece of large equipment. In a hospital nutrition service department, storage department requirements depend upon the form of food purchased. Dry storage rooms should be well ventilated. A desk and possibly a file should be provided for inventory records, requisition and order tests. Foods in prepared form, such as frozen
foods require lower storage temperatures. In a hospital food service unit, vegetable
preparation area should be set up in square or rectangular shape with equipment arranged
on the sides and down the center with one end opened to the main kitchen. The cooking
area is the hub or center of the kitchen and should be located adjacent to the vegetable
preparation area, the pot and the pan-washing unit, the storage rooms and next to the
serving units. This area should be located at one side or end of the room and as close to
the serving unit as possible. The bakery and dessert area should be close to the service
unit as the products from this unit are directly transported to the service unit. The serving
area should be located near the cooking unit but out of main traffic lines. The pot and pan
washing area must provide space and facilities for smooth flow of dishes through sorting,
scraping, washing, rinsing, drying and removal from storage. The dishwashing area
should be away from the dining rooms because of the noise. Employee rest rooms should
be located near the dining area for convenience and security. Both garbage and trash must
be collected and held for frequent removal and a central compact in which waste is
compressed under heavy pressure to small volume may be used. Proper training should
be provided to the personnel involved in the cleanliness, supplies, dish washing and
maintenance of equipments. The food service equipment should be free from open seams,
cracks, chipped places, exposed junctions and sharp corners. Standards of cleanliness and
sanitation will be only as high as those established and enforced by the food service
director (Palachio and Theis, 2012).

2.2.2 Suggested Space Requirement and Physical Facilities for a Hospital Dietetic
Department by DGHS (1989) New Delhi

There are certain norms laid down by DGHS (1989), India, of space requirements for a
hospital dietetic department. These are

- 200 Beds or less - 1.86 sq.m. per bed (186 sq. m for 100 beds)
- 200-400 Beds - 1.67 sq. m. per bed (500 sq.m. for 300 beds)
- 500 Beds and above - 1.39 sq.m. per bed (700 sq.m. for 500 beds)
Storage space also has to be provided for:

- Dry stores-food materials and non-food items
- Cold storage-semi-perishables and perishables
- Cooking gas-outside the department
- Trolley parking-the extent of space needed will depend on the type of service, centralized or decentralized.
- Multiple tank dishwashing machines.

If staff dining facility and cafeteria for visitors are to be provided, there should be another kitchen with access to the dining room/cafeteria. The approximate space requirements for these, according to DGHS (1989) are given in Table 2.3 as follows:

<table>
<thead>
<tr>
<th>Area</th>
<th>Sq.m. per bed</th>
</tr>
</thead>
<tbody>
<tr>
<td>Dining</td>
<td>0.75</td>
</tr>
<tr>
<td>Service and guest facilities</td>
<td>0.24</td>
</tr>
<tr>
<td>Kitchen (production)</td>
<td>0.47</td>
</tr>
<tr>
<td>Storage</td>
<td>0.13</td>
</tr>
<tr>
<td>Cleaning area</td>
<td>0.19</td>
</tr>
<tr>
<td>Employee facilities</td>
<td>0.50</td>
</tr>
<tr>
<td>Office</td>
<td>0.03</td>
</tr>
</tbody>
</table>

*Source: DGHS (1989)*

The Dietetics Department should be rectangular in shape with rounded corners, well lit and well ventilated. The floors should be smooth and impervious, sloping to the drains. Windows and doors should be made fly proof. Ventilating hoods and adequate exhaust fans should be provided. Running hot and cold water should be available. The layout should be planned with adequate space for storage, preparation, washing area and office area. Employee facilities and garbage disposal should be provided outside the main unit.

### 2.3 FOOD PRODUCTION

The process of food production involves collecting ingredients, weighing and measuring them according to standard recipes, preparation techniques, cooking methods, dishing out for service and clearing up for the next production (Sethi, 2011). Hospital food has come
into focus during the last decade due to reports of under nutrition and at the same time, food service has undergone significant changes.

In order to improve patient nutrition care in hospitals, integrating food production and patient nutrition is helpful in patient nutrition. In western countries, the system of food production has changed over a period of time. The job profile of employees in the kitchens has followed change in recent years. During the period 1995-2003, there has been less use of central plating with a higher use of buffets and satellite kitchens. The educational background of employees has also changed resulting in an increase in number of skilled employees (cooks, catering assistants) and fewer unskilled employees in the kitchens. Increased focus on nutritional status of patients has been observed from ward personnel with no connection to the kitchen. It is suggested that food ambassadors be responsible for the nutritional status of patients (Engelund et al, 2007).

Food production involves several aspects such as the hospital menu, purchase, receiving, storage and food costing

2.3.1 Hospital menus
Menu is the basis for food production. Hospital menus may be designed to meet nutritional requirements. However, in practice, the planned food may not be eaten by individuals who are unwell or have a suppressed appetite, and hence, nutritional needs of such individual will not be met. Menu planning needs to take into consideration the patients dietary needs and other factors which affect food intake in order to provide a service which has choice, flexibility and meals that will be eaten. A multi-disciplinary group working together and planning a menu, needs to consider the special nutritional circumstances of hospital patients and allow each member to share specific knowledge and skills regarding the patient needs and hospital services (Thomas and Bishop, 2007).

Hospital menus must meet the nutritional requirements of diverse patient groups. To assist the patient in making a faster recovery and maintain a better standard of well being, the menu planner must strictly follow dietary regulations that have been set by the
dietitian. Provision of a menu that meets the nutritional requirements outlined for hospital patients, must also be a menu that provides choices of dishes that tempt patients to eat, and which they will enjoy.

Some guidelines for planning menus are as follows

- Use at least a three week cycle for menu planning.
- Ask the patients about their food habits and preferences and follow these as often as possible
- Serve fresh fruits and salads.
- Plan at least one cup of milk or a milk product a day
- Include sea food and fish at least twice a week for non vegetarian patients
- Serve soups and foods with high amount of water (such as salads, cucumbers, tomatoes, any kind of fruits) everyday to increase the fluid intake of patients.
- Serve 1.5 to 2 litre beverages, like water, fruit/herb tea everyday.
- Prefer cooking methods such as poaching, steaming, pressure cooking, roasting/sautéing, baking and broiling to prevent vitamin loss (Nestle, 2007).

A menu has to be more than a list of foods. It should contain foods that are of high nutritional value. Menu is a list of dishes planned for production in a catering operation. A menu forms the core of all other activities in a food service establishment. The success of a food service operation depends on the food service managers who plan the menus and how they do it (Sethi, 2011). Menu planning is important for food service institutions like hospitals. Good practices should be established through the development of national guidelines and standards for food provision in hospitals to meet the needs of all categories of patients including diets on medical indications, vegetarian, texture modified and energy and protein dense menus. A range of dishes enriched in energy and protein should be available in every hospital aimed at patients with disease-related undernutrition. The nutrient sufficiency of a menu should be documented at the planning stage itself. The Clinical Nutrition Service/Department, the Nutritional Steering Committee, or the Nutritional Support Team or an adequately qualified person, should be given the responsibility for ensuring that the menu reflects nutritional standards. A database on nutrient content of meals/ menus and portion sizes should be established in
each food service department to be made available for the purpose of assessing nutritional adequacy of menus and monitoring of food intake of patients. It is important to remember that a menu is a live document and as such should be reviewed and updated regularly in order to continue to meet the dietary needs of a potentially changing hospital population (Council of Europe, 2003a).

2.3.2 Purchasing
Good food purchasing is the basis for preparing and serving meals. Purchasing is an essential function in any food service system. Realistically hospitals need to rethink their operations if they are to buy locally. Hughes (2006) points out those hospitals pursuing this policy need a kitchen so they can cook ingredients from scratch. They also require the flexibility to have a seasonal menu and to go with whatever produce is available (Sethi, 2011).

2.3.3 Receiving
The receiving area should be located near the delivery door and should be convenient to the storage areas. Purchases should be inspected for condition and checked against the invoice or delivery slip. The vendor’s delivery slip should only be signed after making sure that all received goods ordered are in proper condition (Palachio and Theis, 2012).

2.3.4 Food storage
After receiving, proper food storage is very important to prevent loss or waste. Dry, refrigerator and freezer storage should be adequate for food supplies. Proper ventilation, temperature and humidity controls are necessary for food quality (Palachio and Theis, 2012).

2.3.5 Storage practices
If foods are not properly stored after they have been received and checked, their quality is jeopardized (Palachio and Theis, 2012). Safely cooked foods can become cross contaminated through even the slightest contact with raw food. Therefore, it is imperative to avoid contact between raw foods and cooked foods (WHO, 1999), through proper
storage. An investigation, including environmental sampling, was undertaken after four leukemic patients on the same hospital ward developed serious infections with Klebsiella aerogenes, capsular type K14. The source of this organism, common to all four patients, was found to be a food blender used for preparing milk-based drinks on the ward (Kiddy et al, 1987).

2.3.6 Food cost
Food is the most easily controlled item of expenditure and the one subject to greatest fluctuation in the food service budget. When assessing the cost of different food preparation systems, the patient's satisfaction with the food served should be considered. The food budget should be valued as part of the budget spending on clinical support and treatment services. Hospital managers should take into account the potential cost of complications and prolonged hospital stay due to undernutrition, when assessing the cost of nutritional care and support.

2.3.7 Preparation
Since foods are so easily contaminated, any source used for food preparation must be kept absolutely clean (WHO, 1999). The preparation/process/cooking should be adequate to eliminate and reduce hazards which might have been introduced at the raw food level, to an acceptable level. The preparation/processing/cooking methods should ensure that the foods are not re-contaminated. The preparation/processing/cooking of vegetables and non-vegetarian products should be segregated. Food should not be overcooked or charred leading to chemical hazards. Whenever cooking or reheating of food is done, it should be hot all the way through. It is especially important to make sure that food is cooked thoroughly because there could be bacteria in the centre of the food. Re-use of cooking oil should be avoided (Food Safety and Standards Regulations, 2009).

2.3.8 Holding of Food
Cooked food should be consumed soon after cooking is finished. However, in most food service establishments, cooked foods need to be held for sometime before they can be served, since all customers/patients may not be served at the same time. Food needs to be
prepared in advance; it should be held either hot above 60° C or cool below 5° C (WHO, 1999), to prevent growth of pathogens. Otherwise, time of holding should be limited.

2.4 FOOD SERVICE AND DELIVERY

Food service managers have a responsibility for making certain that after food is prepared it is safely delivered and served to patients. There are two major types of food delivery/service/systems. These are centralized and de-centralized.

Centralized delivery service system is commonly used in hospitals and health care facilities. In this service system, food items are portioned and plated and trays for individual patients are assembled in the central serving room.

Decentralized Delivery Service System is the one in which food items are sent hot and/or cold to serving pantries or ward kitchens located throughout the facility, from where patients are served (Palachio and Theis, 2012).

The food service system in hospitals should be adjusted to the patients' needs taking into consideration their physical and mental condition. This often requires different serving systems. All patients should have the possibility to choose their eating environment and to sit at a table when eating their main meals. The hospital eating environment should be improved with a focus on surroundings free from unpleasant smell/odours. Adequately trained personnel should be available to assist patients with mental/physical feeding difficulties and suitable modified equipment should be available when required to aid/facilitate independent feeding. Food service is a system in which meals are produced for hospital patients. The system includes the food service premises, the production and distribution technology, and human resources involved in management, production, distribution and serving. The supply of food to patients and staff is the responsibility of hospital support services (Barrie, 1996).
2.4.1 Food service in hospitals and nursing homes

Food and catering services in hospitals are all evidences of large scale food preparation and services. The development of these food services has closely followed the changes in the eating habits and needs of patients. With modernization, more and more patients are admitted to the hospitals thereby increasing meal service. While type of food services is varied and the number increasing every day, we need to focus on educating/training workforce and/or developing manpower for this emerging field. In the field, technical knowledge is necessary for this specialized area. Foodservices in nursing homes and hospitals reveal that there is lack of information about the nutritional quality of foods served. The nutrient content of foods prepared in large quantities lack data pertaining to nutrient content of foods served. The foodservice industry is growing rapidly with new technological innovations and management practices. However, little effort has been made toward knowing the nutrient quality of foods served by various foodservice operations, as in hospitals (Khan and Rao, 1983).

2.4.2 Trolley service and tray service in hospitals

Tray service is essential for providing appropriate nutrition care to patients and maintaining patient satisfaction. A monitoring system of tray assembly error rates was designed to evaluate patient tray accuracy and to identify types of assembly errors. The trays at various meal timings were assembled and two mornings, five noon, and five evening meals were assessed. They were also classified with respect to compliance to diet or contradictory to diet order. This was compared by meal, weekday vs. weekend, and first half of assembly period vs. second half. This study resulted in serving as the basis for quality control monitoring and as a motivational tool to stimulate improved performance by tray service employees (Dowling and Connor, 1988).

A study by Hartwell and Edwards (2003) was done to compare two hospital food service systems using parameters of food safety and consumer opinion. A hospital was selected where food delivery was due to change from a plated system to a cafeteria trolley system. Samples (50g) of dishes considered to be high-risk were collected for three consecutive days from breakfast, lunch and supper meals. The samples were taken from a pre-ordered
tray (similar to that of a patient) in the plated system and from the trolley on the ward in the cafeteria system of meal delivery, approximately six months after its introduction. Consumer opinion cards were distributed and interviews were also conducted. Microbiologically, the quality of food items delivered by both systems was satisfactory. However, concern was raised with the plated system, not for hot foods cooling down but for chilled foods warming up and being sustained in ambient conditions. Overall patient satisfaction and experience was enhanced with the trolley system. Food was hotter and generally perceived to be of a better quality. Satisfaction with cold desserts was not dependent on the delivery system.

2.4.3 Room service food delivery system with patient’s caregivers
Patients who receive a service in which they eat with a caregiver have a greater caloric intake, protein intake, and/or degree of patient satisfaction than patients randomized to dine independently. However, in a study by Gurley et al, (1998), food was delivered via room service to caregivers of subjects randomized to dine with caregivers. Food intakes of each subject from food diaries, specifically with respect to kilocalories and grams of protein and patient satisfaction were assessed. Regarding patient satisfaction, there was no significant difference between the two groups. However, patients with tumors decreased their intake as the three days progressed, while patients with leukemia increased their intake as the days progressed. In the paediatric research hospital setting, parents dining with patients did not appear to increase caloric intake, protein intake, or patient satisfaction.

2.4.4 Hospital caterer
Currently a large number of hospitals in India are employing the services of professional caterers for production and service of meals in hospitals. The goal of any hospital caterer should be to provide food that meets nutritional requirements, satisfies the patient, improves morale and is microbiologically safe.
2.4.5 Hospital catering services

Hospital catering services are an essential component of nutritional care and should be flexible and responsive to patient needs. Hospital catering facilities have the same requirements as other catering establishments. Meals are prepared and transported to the wards to be served immediately. Throughout transportation and serving of food, its temperature must not fall below 65° C. Close liaison between clinical and catering staff is vital if patients are to receive what they need, when they need it and in a form in which they can eat (Kyle et al, 2005).

2.4.6 Contract food service

Guidelines and standards for out-sourcing hospital food service should be developed. Contracts should be sufficiently detailed and they should cover special diets on medical and personal indications, energy and protein dense menus and provision of snacks and/or meals at ward or near-ward level. They should also cover texture-modified menus for the management of dysphagia. The cost for adequate contract monitoring should be built into the contract. The Clinical Nutrition Service/Department, the Nutritional Steering Committee, the Nutritional Support Team or an adequately qualified person should be given the responsibility for ensuring that the contract reflects nutritional standards (Council of Europe, 2003a).

2.4.7 Meal Service to Patients

Patient meals are an integral part of treatment. Hence the provision and consumption of a balanced diet is essential to aid recovery. Meal service quality, food quality, staff/service issues and the physical environmental indicates an accurate, reliable measure of patients’ food service satisfaction. Assessment of meal service quality differentiates and collects detailed information about foodservice attributes and allows the application of systematic measures to improve foodservice quality. It also provides a tool for the continuous assessment of foodservice quality and measurement of changes in patients’ foodservice satisfaction (Capra et.al, 2005).
Patient menu choice is beneficial to improve the process of patient meal service. A study was done in a UK based hospital to see if menu choices improve patient’s satisfaction to meal service. It was seen that a fair percentage of patients (35%) did not select their menu options. However, menu selection optimized patient nutrient intake, improved patient satisfaction, and significantly reduced labor costs (Petnicki, 1998).

### 2.4.8 Inpatient and Outpatient Nutrition Services

Inpatient treatment is a type of treatment in which a patient is provided with 24 hour care at a hospital. Patients are educated on their modified diet prior to discharge. Outpatient treatments vary depending on the patient’s needs and the facility but they typically meet a couple of times every week for a few hours at a time. Unlike inpatient treatment, outpatient treatment does not often address medical conditions and nutritional needs. With inpatient treatment, everything is provided at one location. Outpatient treatment is desired by many people because of its flexibility (Casa Palmera, 2009).

Knowledge of patient satisfaction with services is important as nutrition professionals need tools to confidently assess the service provision and educational materials provided as part of that service. According to Scott-Smith and Greenhouse (2007), the nutrition services in the care of in-patients need an interdisciplinary team which can achieve the following goals:

- Establishing standardized systems at both facilitates inpatient and outpatient
- Improving patient care
- Improving work efficiency
- Limiting the number of health care provider contacts for each patient
- Reducing cost of care

### 2.4.9 Patients’ food perception

Patients’ perceptions of food service, food quality, service timeliness, service reliability, food temperature, attitude of the staff who deliver menus, attitude of the staff who serve meals, and customization, determine the patient satisfaction with nutrition services. Food quality was the best predictor of patient satisfaction with meals and foodservice, followed
by customization and attitude of the staff who deliver menus. Individual characteristics like gender, age, education, perception of degree of control over health, and belief that food influences one's health status and factors like normal or therapeutic diet, time spent at rest, and appetite influence patient satisfaction (Dube et al, 1994).

2.4.10 Monitoring patient’s meals
Monitoring of patients meals and food intake is helpful and important in improving quality of food services in hospitals. Monitoring should include specific characteristics like taste, appearance, colour, texture and temperature of the food served in the hospital. This increases the level of patient satisfaction with the food services for hospital managers and the food and nutrition departments. Also, this is helpful in monitoring the quality of food services in hospitals (Sahin et al, 2006).

2.4.11 Meal rounds: an essential aspect of quality nutrition services
A meal round by a dietitian is an essential aspect of quality nutrition services in long term care of hospital patients (Keller et al, 2006). Meal rounds can be a continuous quality improvement activity to readily identify nutrition risk factors that can influence weight change. The occurrence of weight change results from multifactorial processes, some of which can be considered nutrition risk factors. Feeding and eating difficulties are prevalent in patients, especially those with dementia. The proposed intervention of meal rounds can improve the quality nutrition services.

2.4.12 Nutrition counselling for in-patients in hospitals
Dietary counselling is vital for patients. Amongst the several responsibilities of dietitians in a hospital, important tasks to be performed by them include diet counselling by which patients are provided with diet charts with respect to their diseases. However, many patients do not make use of professional dietetic services like dietary counselling and education. There appears to be scope to improve uptake of dietetic services by patients, and to investigate further individual factors that affect access and usage (Robson et al, 2001).
2.4.13 Nutritional screening

Several steps are involved in the process of improving dietary intake in hospitals. These include screening of patients to identify those at nutritional risk, monitoring dietary intake, modifying the hospital diet as necessary according to the patients' preferences, and ensuring that serving and ambience of mealtimes are focused on the patient with reduced appetite. By combining regimens ranging from a regular hospital diet to total parenteral nutrition, food can constitute about 60% of total nutrient intake in at risk patients. Furthermore, significant loss of body weight can be avoided in 90% of the patients and in those who cannot be weighed, if dietary intake is satisfactory in 95% of the patients (Kondrup, 2001).

2.5 Food Sanitation and Hygiene in the Kitchen

Inadequate sanitation is a major cause of disease world-wide and improving sanitation is known to have a significant beneficial impact on health, both in households and across communities. The word 'sanitation' also refers to the maintenance of hygienic conditions, through services such as garbage collection and waste water disposal (World Health Organization, 2012). Food sanitation and safety is a scientific discipline describing handling, preparation, and storage of food in ways that prevent food borne illnesses. This includes a number of routines that should be followed to avoid potentially severe health hazards (Satin, 2008).

In India, ‘Food Safety and Standards Authority of India’ (FSSAI), established under the Food Safety and Standards Act, 2006, is the regulating body related to food safety and laying down of standards of food in India. In 2003, the WHO and FAO published the Codex Alimentarius which serves as a guideline to food safety (Codex Alimentarius, 2007). ISO 22000 is a standard developed by the International Organization for Standardization dealing with food safety. This is a general derivative of ISO 9000. The ISO 22000 International standard specifies the requirements for a food safety management system that involves interactive communication, system management, prerequisite programs, and HACCP principles. Routine cleaning of “contact” (hand, food
and drinking water) sites and surfaces (such as toilet seats and flush handles, door and tap handles, work surfaces, bath and basin surfaces) in the kitchen, bathroom and toilet reduces the risk of spread of germs (Bremner et al., 2008).

The five key principles of food hygiene, according to WHO (2010), are:

- Prevent contaminating food with pathogens spreading from people, pets, and pests.
- Separate raw and cooked foods to prevent contaminating the cooked foods.
- Cook foods for the appropriate length of time and at the appropriate temperature to kill pathogens.
- Store food at the proper temperature.
- Use safe water and cooked materials.

2.5.1 Food Hazards

Food hazards can be due to biological or chemical contaminants or physical factors.

- Among these, biological contaminants are the most important in the Indian context. Biological contaminants include protozoa, yeast, bacteria, moulds and viruses, which are included under invisible biological contaminants/hazards. Visible contaminants include weevils, caterpillars, flies, worms and cockroaches.

- Chemical hazards: chemical hazards are toxic substances that may occur naturally or may be added during processing of food. It includes agricultural chemicals-pesticides, fertilizers and antibiotics, heavy metals such as lead, mercury, food additives and food allergens and cleaning compounds.

- Physical hazards: physical hazards are hard or soft foreign objects in foods that can cause illness and injury. These include items like stones, metal pieces, tooth picks, bandages, staples, glass, fingernails, hair and wood (Swane et al, 2003).

2.5.2 Sanitary practices

Food borne diseases are easily preventable if food handlers receive extensive education and practice constant vigilance. If an employee starts work in a place that is clean and is kept clean all the time, he will soon acquire the same habits. So cleanliness should become a part of life (Kahrl, 1977). Effective use of sanitary procedures and their proper
implementation is the only way of maintaining hygienic conditions, enabling food served to be safe and socially accepted (Roday, 1999).

Most hospitals serve meals from breakfast to dinner. Sanitation of eating establishments is a challenging problem in food sanitation. The following minimum standards have been suggested for food service establishments in India under the Model Public Health Act (1955) gives the following are recommendations:

- Location shall not be near any accumulation of filth or open drain, stable, manure pit and other sources of nuisances.
- Floors should be higher than the adjoining land, made with impervious material and easy to keep clean.
- For storage of uncooked foodstuffs, perishable and non-perishable articles should be kept separately, in rat-proof and vermin proof space. For perishable articles, temperature control should be adopted.
- For storage of cooked food, a separate room should be provided. For long storage, control of temperature is necessary.
- Rooms where meals are served shall not be less than 100sq.feet and shall provide accommodation for a maximum of 10 persons and walls upto 3 feet which should be smooth, impervious, easily washable and corners should be rounded. Lighting and ventilation should be ample. Natural lighting facilities aided with good circulation of air are necessary.
- Kitchen floor space should be a minimum of 60 sq. feet, window opening to be 25% of floor area; floor should be impervious, smooth and easy to keep clean.
- Doors and windows should be rat-proof, fly-proof and of the self-closing type. Ventilators should be 2% of the floor area, in addition to smoke pipes.
- Furniture should be reasonably strong and easy to keep clean and dry.
- Disposable of refuse: This should be collected in covered, impervious bins and disposed off twice a day.
- Water supply should be from an independent source, adequate, continuous and safe.
- Washing facilities should be provided, cleaning of utensils and crockery should be done in hot water and followed by disinfection.
2.5.3 Food safety in hospital kitchens

The World Health Organization (WHO) defines food safety as the conditions and measures that are necessary during production, processing, storage, distribution and preparation of food to ensure that it is safe, sound, and wholesome and fit for human consumption (WHO, 1984). Food safety remains a critical issue nowadays among professionals in the food service sector as well as consumers (Badrie et al, 2006; Scheule et al, 2001). This is basically due to outbreaks of food-borne diseases resulting in substantial costs to individuals and the economy (Egan et al, 2007; Kaferstein et al, 2003) and indeed the widespread and increasing incidence of food-borne diseases has severe social and economic impacts on the human population (Molins et al, 2001).

Food safety is more importantly a public health issue as it plays a noteworthy role in health development and consequently national economic development. Thus great endeavours should be made to improve it at all levels of the food chain. As part of the food chain, hospitals are required to give detailed attention to food hygiene in order to minimize food hazards, given that the patients represent a vulnerable group of the society.

2.6 HOSPITAL ADMINISTRATORS IN NUTRITION SERVICES

Hospital food and nutrition administrators are challenged to consistently evaluate ways to reduce food costs and also maintain food quality. Hospital administrators manage hospitals, outpatient clinics, hospices, and drug-abuse treatment centers. In large hospitals, there may be several administrators, one for each department. In smaller facilities, they oversee the day-to-day operations of all departments. Administrators make sure hospitals operate efficiently and provide adequate medical care to patients of which nutrition care is an important part. Their responsibilities are numerous and sometimes require the assistance of the medical and support staff. They act as liaisons between governing boards, medical staff, and department heads and integrate the activities of all departments so they function as a whole. Administrators recruit, hire, and sometimes organize training for doctors, nurses, interns, and assistant administrators. Administrators
plan budgets and set rates for health services. In research hospitals, administrators develop and expand programs and services for scientific research and preventive medicine. Administrators plan departmental activities, evaluate doctors and other hospital employees, create and maintain policies, help develop procedures for medical treatments, quality assurance, patient services including nutrition services for inpatients; and public relations activities. They need to keep up with advances in medicine, computerized diagnostic and treatment equipment, data processing technology, government regulations including those related to nutrition care, health insurance changes, and financing options (The Princeton Review, 2012).

2.7 DIETITIANS IN NUTRITION CARE

Dietitians supervise the preparation and service of food, develop modified diets, participate in research, and educate individuals and groups on good nutritional habits. They also provide medical nutritional intervention via safely prepared and food, serve and advise on flavoursome, attractive, and nutritious food for patients, groups and communities. Professional dietitians may also provide specialist services such as in diabetes, obesity, oncology, osteoporosis, paediatrics, renal disease and micronutrient research (WHO, 2010).

The role of dietitian has come a long way since the early 1900s. Their role is still unknown to a lot of people. Some think that dietitians, as their name implies, only give out diets to make individuals lose weight, whereas this is a small part of their role. The dietitian is the link between the patient and medical team or physician in assisting difficult decision making about nutrition care. Asian Society of Parenteral and Enteral Nutrition (ASPEN) state that the dietitian role in nutrition care has been recommended an adequate source and amount of balanced nutrients according to pre-established standards of care. A dilemma occurs when the disease state of the patient confound the adequacy of nutritional support, which has resulted in the patient’s malnourishment.

The responsibilities spelt out for dietitians in hospitals are: -

✓ Planning food and nutrition programmes.
- Supervising meal preparations in hospitals.
- Recommending dietary modifications.
- Educating patients on diets that may help their condition.
- Working with other healthcare professionals to provide a multidisciplinary healthcare approach.
- Informing patients on the severity of illness and complications of treatments, inclusive of the benefits and burdens of feeding via different routes.
- Being active in the patients care, reporting on the nutritional status of the patient, as well as advising the physician and medicinal team, and
- Informing the legal decisions that may help determine the route of nutrition care for the patient, such as more aggressive or palliative care (Poonia, 2008).

In case of enteral feeding, dietitians are responsible for calculating nutrient and fluid needs, selecting formulae, determining the home feeding schedule, teaching the patient to prepare blended formulae, and teaching the patient to recognize formula intolerance. Dietitians should teach the patient to administer the formula, operate the pump, and flush the feeding tube. Dietitians have a larger role in hospitals which have a nutrition support team (Skipper and Rotman, 1990).

- **Dietary clerks**

According to CBsalary (2011), *Dietary clerks*, are also known as "medical diet clerks" or "dietary workers." They prepare dietary information for use by kitchen personnel in preparation of foods for hospital patients following standards established by a dietitian. They examine diet orders, prepare meal trays, maintain the storage area for food supplies, and ensure practice of sanitary procedures. They may operate computers to enter and retrieve data on patients' caloric requirements and intake, or to track financial information. Dietary workers are typically trained on the job.

**2.8 ALLIED HEALTH PROFESSIONS**

According to Association of Allied Health Schools (2012), Allied Health Professionals are involved with the delivery of health or related services pertaining to the identification,
evaluation and prevention of diseases and disorders; dietary and nutrition services; rehabilitation and health systems management among others. The precise titles, roles, and requisites of the allied health professions vary considerably from country to country. Usually all allied health professions that require a post-secondary degree or higher qualification, are included, which includes dieticians also.

2.8.1 Allied Health Professions, WHO (2012) classification of dieticians for various countries

− **Clinical dietitians**
Clinical dietitians work in hospitals and health care facilities to provide nutrition therapy and provide dietary consultations to patients and their families. Clinical dietitians provide specialized services in areas of nourishment and diets, tube feedings and intravenous feedings such as total parenteral nutrition (TPN) or peripheral parenteral nutrition (PPN).

− **Community dietitians**
Community dietitians work with wellness programs, public health agencies, home care agencies, and health maintenance organizations. Focus groups are elderly, children, or other individuals with special needs or limited access to healthy food.

− **Foodservice dietitians**
Foodservice dietitians or managers are responsible for large-scale food planning and service. They coordinate, assess and plan foodservice processes in health care facilities, school food service programs, prisons, restaurants, and company cafeterias. Food service dieticians train and supervise other food service workers such as kitchen staff, delivery staff, and dietary assistants or aides. They also perform audits of their departments to ensure quality control and food safety standards, launch new menus and various programs within their institution to meet health and nutritional requirements.
- **Gerontological dietitians**
Gerontology is the study of aging. Gerontological dietitians are specialist in nutrition and aging. They work in nursing homes, community-based aged care agencies, government agencies in aging policy, and in higher education in the field of gerontology.

- **Neonatal dietitians**
Neonatal dietitians provide medical nutrition therapy for critically ill premature newborns in the Neonatal Intensive Care Unit's medical team. The neonatal dietitians performs clinical assessment of patients, helps establish and promote lactation/breastfeeding. They provide guidelines and often oversees the management of infection prevention in the handling, storage, and delivery of nutritional products.

- **Pediatric dietitians**
Pediatric dietitians provide nutrition and health advice for infants, children, and adolescents. Early nutritional needs are focused for these groups. They also work with doctors, school health services, clinics, hospitals and government agencies by developing and implementing treatment plans for children with eating disorders, food allergies, or any condition such as childhood obesity.

- **Research dietitians**
Research dietitians work with dietetics-related research in hospitals, universities, government agencies, food and beverage companies, clinical aspects of nutrition, effects of diet on various diseases, the pharmaceutical industry, the impact of health policies, behavior change, or evaluate program effectiveness. They also survey foodservice systems management in order to guide quality improvement. Some research dietitians study the biochemical aspects of nutrient interaction within the body.

- **Administrative dietitians**
Administrative or management dietitians oversee and direct all aspects of food policy and large-scale meal service operations in hospitals, government agencies, company cafeterias, prisons, and schools. They recruit, train and supervise employees of dietetics
departments including dietitians and other personnel. They set department goals, policies and procedures; purchase food, equipment and supplies; maintain safety and sanitation standards in food preparation and storage; and keep records to monitor areas such as budget control and client information.

- **Business dietitians**
  Business dietitians serve as resource people in food and nutrition through business, marketing and communications. Dietitians’ expertise in nutrition is often provided as expert guest opinion on television and radio news or cooking shows, columnist for a newspaper or magazine, or resource for restaurants on recipe development and critique. Business dietitians may author books or corporate newsletters on nutrition and wellness and work as sales representatives for food manufacturing companies that provide nutritional supplements and tube feeding supplies.

- **Consultant dietitians**
  Consultant dietitians contract independently to provide nutrition services and educational programs to individuals and health care facilities as well as sports teams, fitness clubs, supermarkets, and other health and nutrition-related businesses. Consultant dietitians in Canada and the United States work under contract with health care facilities or in private practice.

### 2.8.2 Required Qualifications

To become a fully qualified, dietitians differ across countries and jurisdictions, as these are adapted to the needs of the individual countries and the opportunities available. Common academic routes include:

- A bachelor degree in Dietetics which typically requires four years of postsecondary studies; or
- A bachelor of science degree and a postgraduate diploma or master's degree in Dietetics or Food and Nutrition
In addition, dietitians may be required to undergo an internship to learn counselling skills and aspects of psychology. The internship process differs across countries and jurisdictions.

2.9 Diet /Nutrition Counselling and Education
Diet counselling and education are also a major responsibility of a dietitian. The patient-centered counselling model of Rosal et al (2001) enhances long-term dietary adherence. This model facilitates change by assessing patient needs and subsequently tailoring the intervention to the patient's stage in the process of change, personal goals and unique challenges. Patient centered counselling involves a four step process including (a) increasing the patient's awareness of his/her diet related risks (b) providing the patient with nutritional knowledge (c) increasing in the patient's confidence in his/ her ability to make dietary changes and (d) enhancing skills needed for long term adherence to dietary change plans.

2.10 Nutrition education
Nutrition education is very important for in-patient care in hospitals. Many patients require nutritional education when admitted, to help treat and/or prevent malnutrition. To improve the nutrition, pre-printed nutrition care plans and a specialist as a dietitian is helpful. Nutrition education programmes update the gaps identified and additional requirements for the patients, and dietitians play key role in this (Peake et al, 2001). Some nutrition education may be required for doctors, nurses and other paramedical staff.

2.11 Responsibilities of the Chief Dietitian/Sr. Dietitian/ Dietitian
The Chief Dietitian shall be head of the dietetics department and will report directly to the Head of the Hospital. The chief responsibilities of a dietitian as recommended by DGHS (1989) relate to food service management, nutritional care of patients and nutrition education. The specific responsibilities under each of these are as follows:

- **Food Service Management**
- **Menu Planning**
- **Food Purchasing**
- Maintainance of safe food storage practices
- Supervision of food preparation
- Supervision of food distribution
- Selection, training and supervision of personnel
- Supervision of sanitation and hygiene of the dietary department.
- Financial control of dietary budget and records.

- **Nutritional Care of Patients**
  - Nutritional assessment
  - Planning of diets
  - Ensuring provision of adequate diets to patients
  - Diet counselling
  - Assessing effectiveness of dietary management in patient care.

- **Nutrition Education**
  - Imparting nutrition education to nurses, paramedical workers, medical personnel and patients.

### 2.11.1 Responsibilities of Assistant Dietitian

According to DGHS (1989) the following job responsibilities have been enlisted or defined for assistant dietitians.

- Scrutinize and compile daily diet indents
- Supervise food preparation and ensure proper distribution
- Check food wastage at different levels
- Ensure hygienic practices by the food personnel and maintenance of sanitation of cooking premises
- Supervise work of stewards, storekeeper and other workers
- Assist dietitians in inventory control
- Maintain duties roster and leave account
✓ Report to dietitian any problems regarding appliances and premises and welfare of the staff
✓ Carry out other duties that may be assigned by head of the department

2.12 RESPONSIBILITIES OF DIETARY SERVICE WORKERS

DGHS (1989) has laid down guidelines for hospital dietary service workers. The responsibility of each staff that comes under the dietetic department has been specified.

2.12.1 Food Service Managers

Food service managers have an important role in the nutrition services offered by a hospital. They may have qualification in nutrition and dietetics, food service management or catering management.

Foodservice managers are responsible for large-scale food planning and service. They coordinate, assess and plan foodservice processes in health care facilities, school food service programs, prisons, restaurants, and company cafeterias. Food service managers may perform audits of their departments to ensure quality control and food safety standards, and launch new menus and various programs within their institution to meet health and nutritional requirements especially if they have a nutrition background. They train and supervise other food service workers such as kitchen staff, delivery staff, and dietary assistants or aides (Alberta Occupational Profiles, 2011).

Foodservice managers who desire to improve patient satisfaction should focus attention on meeting or exceeding patient expectations for food quality. A study done at a Suburban Dialysis center in US evaluated quality of food and nutrition services using the ratings of inpatients and patients who had been discharged (post discharge patients). Food and nutrition services indicated that patients were satisfied; few differences were found in ratings on the basis of patient demographics. Food quality was the best analyst of overall satisfaction for both inpatients and post discharge patients. As patient expectations were increasingly met or exceeded, patient ratings of quality increased. The majority of
patients in the matched sample gave the same ratings on the inpatient and post discharge questionnaires (Lau and Gregoire, 1998).

2.12.2 Stewards

Stewards’ duty is to make sure that every item in the kitchen is ready for use and these items include the utensils, dishes, tools, and the whole kitchen area itself. According to Career Planner (2012), stewards should

- Supervise kitchen employees not actively engaged in cooking to ensure clean, efficient, and economical food service and assigns such activities as dishwashing and silver cleaning to kitchen helpers and other non cooking employees
- Inspect kitchens, workrooms, and equipment for cleanliness and order
- Hire and discharge employees, and post time and production records
- Observe and evaluate employees' performance to devise methods for improving efficiency and guard against theft and wastage
- Take inventories of china, silverware, and glassware
- Report shortages and requisition replacement of equipment from steward / stewardess or purchasing agent.

DGHS (1989) has also given guidelines for the responsibilities of stewards / supervisors, as they also have a role to play in the nutrition services in hospitals.

- **Responsibilities of Steward/Supervisor**
  - Receive diet sheets and prepare distribution charts
  - Daily inspection of kitchen staff for personal appearance, cleanliness and uniform
  - Maintain record regarding diet indent and diet census
  - Assist dietitian in periodical health check up for employees
  - Inspection of entire kitchen equipment for cleanliness and maintenance
  - Ensure strict compliance to the diet plan
  - Supervise cooking and proper distribution of food
  - Deal with minor accidents in the kitchen and report to dietitian
  - Take-over store-keeper responsibilities during his off days or leave period
  - Carry out other duty assigned by the Head of the Department from time to time.
2.12.3 Head Cook

In a dietetic or food service department, cooks receive food articles according to the indent from the Steward/Store keeper. They are responsible for preparation of food according to the menu. They also maintain their units, cooking ranges and other appliances clean and in good condition, observe strict personal hygiene and take safety precautions to prevent fire and injuries to those working in the kitchen (DGHS, 1989). Their main responsibilities as defined by DGHS (1989) are

- **Responsibilities of Head Cook**
  - Supervise the work of the kitchen staff
  - Check wastage and spoilage of food
  - Care and maintenance of the equipment
  - Ensure sanitation and cleanliness of the department
  - Maintain a high standard of food preparation
  - Receive supplies in absence of store-keeper and report to store-keeper/steward
  - Supervise food service at kitchen level
  - Assign duties to kitchen staff
  - Ensure timely service of meals
  - Perform other duty assigned to him/her from time to time.

In addition, according to Saint Johns Care Trust (2012), the head cooks may have other responsibilities such as

- Undertake menu planning in consultation with the food service manager or dietitian
- Oversee and participate in the preparation and cooking and serving of main meals, snacks, in accordance with specified menus
- Ensure menus are displayed showing choices
- Determine quantities to be cooked and size of portions to be served, taking into account diets to meet medical, ethnic and personal needs
- Check quantity and quality of stock received and notify suppliers of deficiencies
✓ Where meals are provided for another establishment and the community, oversee the packaging of the meals in the absence of the Chef
✓ Oversee washing and cleaning of floors, crockery, utensils, work surfaces and other kitchens equipment to ensure that the necessary hygiene and health and safety standards are maintained in the kitchen and dining room as appropriate
✓ Ensure that the appropriate clothing, including head wear, is worn at all times
✓ Co-operate fully with the statutory inspections and implement recommendation as appropriate
✓ Act as Supervisor to the Kitchen Staff Team
✓ Deputize for the Chef during his/her absence
✓ Undertake such other duties as may be determined from time to time within the general scope of the post and be aware that social activities connected with the home
✓ Possible requirement of voluntary work attendance outside normal working hours.

2.12.4 Storekeeper
The storekeeper is another important member of the food service unit of a hospital. The responsibilities of a storekeeper have been outlined by DGHS (1989).

- **Responsibilities of the Store Keeper**
  ✓ Receive, check and store supplies
  ✓ Get sample of food from contractor approved
  ✓ Make local purchase of food articles not supplied by the contractor.
  ✓ Check refrigerator and its stores
  ✓ Keep all storage space clean and in order
  ✓ Weigh and issue stores to kitchen
  ✓ Check the bills, verify and submit to Dietitian
  ✓ Maintain records and stock books upto date
  ✓ Physically check stores every month
  ✓ Be responsible for account of items, their condemnation and loss
  ✓ Deal with correspondence with the suppliers
✓ Take over responsibilities of steward in his absence
✓ Perform any other duty assigned by the Head of the Department of Dietetics.

A store keeper ensures that material from trucks is unloaded by hand or with hand operated or motorized equipment. He inspects items, as to quality and quantity, against freight documents. He counts, weighs, and measures goods received or issued; unpacks incoming goods and wraps and packs outgoing goods. He stocks materials according to a prescribed inventory system; dispenses items and posts amounts of items to inventory control cards or automated systems. He may enter data and edit stock orders in a computerized inventory system, if available. He participates in physical inventories by counting stock, cleaning work area and may assist in training lower-level workers (Michigan Civil Service Commission, 2012).

2.12.5 Helpers
For efficient functioning of a hospital food service unit (FSU), there is a requirement for some helpers in the kitchen and cleaning staff. Duties spelt out by DGHS (1989) for helpers are to:

- **Responsibilities of Bearers and Mates (Helpers)**
  ✓ Help the store-keeper in weighing the raw materials to be issued
  ✓ Collect raw materials from the stores
  ✓ Clean rice and *dals*, wash and cut vegetables, make dough and assist in preparation of *rotis*
  ✓ Clean and arrange equipment in the kitchen
  ✓ Assist the cooks in food preparation
  ✓ Transfer soiled dishes from kitchen to dishwashing area
  ✓ Scrape and wash pots and pans thoroughly
  ✓ Use proper detergents and methods for cleaning as per instructions given
  ✓ Stack and return the utensils to the storage area
  ✓ Carry food from the kitchen in trolleys to the wards
✓ Carry out any other duty that may be assigned by the Head Cook from time to time

2.12.6 Cleaning Staff
Cleaning staff is responsible for removing trash, rubbish and debris from the premises. This may include emptying garbage bins, sweeping and collecting debris from the floor and gathering litter that may have been left on the grounds (eHow, 2012).

- Responsibilities of Cleaning Staff
  ✓ Disposal of garbage
  ✓ Cleaning, mopping and scrubbing of floors and walls
  ✓ Other assigned cleaning.

2.13 TRAINING THE FOOD SERVICE STAFF

All hospital nutrition service employees must participate in regular training to learn the principal elements of the process and tools for team success in patient care. Training is an ongoing job for all food service employees. Learning new techniques of food preparation or presentation takes time. Usually more than one training session is required. Employees who need one-on-one instruction need to be followed up. Educational tools like mini-posters in the kitchen can be used to reinforce knowledge or skills covered in training sessions. Reinforcement of training by complimenting employees’ positive behaviours is beneficial. All manipulative or hands-on skills need to be demonstrated, and competency should be documented on a skills checklist (National Food Service Management Institute, 2012).

Hospital wide the team spirit is essential. Employees need to suggest opportunities for improvement and talking cross departmentally to solve problems in nutrition care, which would greatly improve those employed. Nutrition care teams need to implement changes which directly impact Food and Nutrition Services. A departmental team at Howard County General Hospital analyzed the system and implemented changes which increased
efficiency. Communicative patient care teams enhanced the ability of the dietitian to better serve the patient (Meyer, 1995).

2.14 ROLE OF NURSES IN NUTRITION CARE

The nurse is the hub of all activities in a hospital, centered on the patient, who makes the patient get more individualised care. Archibald (2006) emphasized the importance of good nutritional intake for patients in hospital care. On busy wards, nutrition is often overlooked in favour of other aspects of care. Nurses' increased knowledge about assessment of nutritional needs, nutritional care and personal capabilities, can improve patients' experiences and outcome.

Nurses prepare the areas around patients beforehand, for example, bedside tables are cleared before the meal service. Nurses will ensure patients are positioned appropriately and safely for the meals. The importance of food in the care and treatment of hospital patients has been championed by the nursing profession for many years. Nonetheless it is still a neglected branch of nursing. The Salmon Report (1966) on senior nursing staff structure is widely believed to have diminished the importance of nutritional care as a key nursing role, so much so that the United Kingdom Central Council for Nursing (UKCC) now Nursing and Midwifery Council (NMC) wrote to all registered nurses reminding them of their responsibilities in this area (Wilson and Lecko, 2005).

2.15 ROLE OF DOCTORS IN NUTRITION CARE

Doctors are responsible for all medical treatment and prescribing appropriate treatment including nutritional treatment. In addition, they must provide some nutrition information to patients, in order to provide good care to patients. They can motivate patients to eat healthy and also guide for dietary change. This is especially so, as doctors are usually perceived as the best source of information, by patients.
However, the doctors need to refer to dietitians for actual delivery of nutrition care. In the case of more complicated patients, doctors should utilize the expertise of dietitians for optimal health and nutrition care of the patients (vanDillen et al, 2005).

Royal College of Physicians of London (2002) has given recommendations for doctors (which are relevant to the practice of every clinician) include:

- Nutritional assessment of all patients
- Preventive measures for when patients are seen to be at risk of becoming too thin or too fat
- Well organized treatment when under or overnutrition are sufficient to affect clinical outcome
- All doctors should be aware of nutritional problems and how to manage them. Every doctor should recognize that proper nutritional care is fundamental to good clinical practice
- A doctor should be responsible for ensuring that adequate information concerning nutritional status is documented in a patient's clinical record, and that appropriate action has been taken to deal with any nutritional problem
- Nutritional screening of all patients should be an integral part of clinical practice. Screening is a rapid process that will identify patients who are over nourished or undernourished. If an abnormality is detected, further assessment and a specific management policy should follow
- Primary care, hospitals, nursing and residential homes should develop explicit protocols and standards to cover the whole process of nutritional management
- Hospitals should have a multidisciplinary nutrition steering group to establish policies for nutritional care. Doctors should be actively involved in this development. In addition, doctors should play an active role in a multidisciplinary support team for the care of patients with complicated under nutrition and patients requiring long-term tube feeds or parenteral nutrition
- Those responsible for clinical governance should identify nutrition as an important aspect of clinical practice that involves caterers and many health care...
disciplines. The inadequate provision of nutritional care has both medico-legal and ethical implications

✓ The process and outcomes of nutritional care should be part of regular clinical audit

✓ Medical undergraduate and continuing professional training programmes for doctors should include relevant aspects of clinical nutrition, along with consideration of the inter-relationships between under and overnutrition, and illness and health.

2.16 IATROGENIC MALNUTRITION

Malnutrition during hospitalization is certain at times. Dietary records of hospitalized patients often show energy intakes well below their calculated BMR and their need for an increased supply of essential nutrients, such as protein, is seldom met. The significance of food preparation, food distribution and ward staff attitudes for proper feeding of the patients is important and it is the responsibility of the doctors and dietitians that the nutritional care of every patient is assessed and attended to (Isakson, 1982).

Undernutrition or Iatrogenic malnutrition is a serious problem among patients at hospitals and at nursing homes. The Council of Europe has pointed to five barriers, which are common all over Europe: (1) lack of clearly defined responsibilities, (2) lack of sufficient education, (3) lack of influence and knowledge of the patients, (4) lack of co-operation between different staff groups and (5) lack of involvement from the hospital management (Balkanas, 2002; Council of Europe, 2002; Beck et al, 2003).

Malnutrition is particularly prevalent in elderly populations. Recommended methods of nutritional screening are often too complicated and time consuming for routine application in frail, very old, hospitalized patients. Poor nutritional status in the elderly is associated with numerous factors, including decline in cognitive and functional status, chronic diseases, medications, poor nutrition, isolation and poverty. In a study done on the prevalence of malnutrition, it was found to be high among elderly hospitalized
patients. Dietary habits were significant predictors of poor hospitalized outcome. A questionnaire on dietary habits can serve as a useful tool in assessing nutritional status and prognosis in patients (Kagansky et al, 2005).

2.17 ASSESSMENT OF NUTRITIONAL STATUS ON HOSPITAL ADMISSION

2.17.1 Nutrition screening in hospitals
Nutrition screening is very important for patients with undernutrition admitted in hospitals. According to Corish et al, (2004), undernutrition has been frequently reported in patients on admission to hospital. Because this is not always detected promptly, screening for nutritional risk on admission has been widely advocated. Nutrition Risk Index and Nutrition Risk Score are the two tools for detecting under nutrition of all patients assessed as being at nutritional risk on admission. Although a large proportion of patients on admission are classified as being at nutritional risk, the degree of risk is significantly different depending on the screening tool used. Evaluation of the efficacy of nutritional screening tools should be promoted as seriously as the development of such tools.

A nutrition screening program should be initiated to provide early identification of patients who might benefit from nutrition intervention. All patients need to be screened within 72 hours of admission. Four indicators often used to determine nutritional risk are (1) serum albumin or pre albumin (2) current weight as percent desirable body weight (3) percent of meals consumed or nutrition support by tube feeding (TF) or total parenteral nutrition and admission diagnosis of malnutrition. These help to determine the effectiveness of a nutrition screening procedure for identifying patients at nutritional risk, in implementing appropriate and early nutrition intervention in the acute care setting (Kemp et al, 1995).

Nutritional screening and assessment of patients are not part of the routine procedures at hospital admission, despite a large percentage of patients being malnourished. Similarly, nutritional status of patients and dietary intake is usually not monitored during
hospitalization. In contrast, a great number of laboratory investigations for screening purposes accompany most, if not all, hospital admissions. Laboratories in particular could provide a service for the nutritional interpretation of available routine data, which would help dietitians and clinicians to focus on nutrition related problems. The nutritional implications of basic physical characteristics (age, sex, height, and weight), urinary excretion of ketone bodies, urea and creatinine, and serum concentrations of urea, phosphate, iron and albumin are assessed and the evaluation of protein malnutrition, metabolism, and requirements is emphasized. Nutritional interpretation of routinely available biochemical and basic physical data is essential for nutritional assessment of patients in the hospital (Selberg and Sel, 2001).

Patients must be screened for malnutrition by a dietitian according to the Subjective Global Assessment (SGA), MUST or other screening tools. Malnourished patients can be detected with a structured assessment and documentation of nutritional status. The nutritional screening and intervention has the potential to improve patient care quality (Ockenga et al, 2005), involving modified menus for patients to improve food intake in hospitals. This also emphasizes the importance of nutritional care and optimal nutritional services in hospital.

The main causes for inadequate nutritional care in hospitals is lack of instructions to deal with the nutrition related problems, and lack of basic knowledge with respect to dietary requirements and practical aspects of the hospital’s food provision. Patient-related aspects and the system of food provision also contribute, but only to a small degree. These form the basis of the strategy to improve nutritional care in hospitals (Kondrup et al, 2002).

Malnutrition is still a largely unrecognized problem in hospitals. Malnutrition in hospitalized patients is generally related to increasing morbidity and mortality, costs and length of stay. A study assessed the nutritional status of patients on admission to a general hospital using different scores and to test the sensitivity and specificity of these scores. The nutritional state assessment was performed within 48 hours of admission
using different nutritional indices like Subjective Global Assessment (SGA), Nutritional Risk Index (NRI), Gassul classification, Instant Nutritional Assessment (INA) and a combined index. INA was the best single score to identify patients who are malnourished or at risk of malnutrition and who would possibly benefit from nutritional support (Pablo et al, 2003). Other screening tools like MUST have also been extensively used.

2.17.2 Malnutrition Universal Screening Tool (MUST)
MUST is a five-step screening tool to identify adults who are malnourished or at risk of malnutrition (under nutrition), or obese. It also includes management guidelines which can be used to develop a care plan. Malnutrition, commonly found in hospital in-patients, may have a frequency of up to 40%. Intervention studies suggest this is an independent and reversible prognostic factor. The MUST is a validated, simple tool, enabling systematic identification of malnutrition (BAPEN, 2007). MUST tool is being used and implemented in many hospitals in India such as MAX Health Care. Patients are screened for malnutrition depending upon the length of stay of patients.

The advantage of the tool is its universality. It can be used by different health care professionals and with a variety of client groups. It can be used in hospitals, nursing homes, and in the community (Godfrey, 2004).

Besides the various screening tools, comprehensive assessment of nutritional status includes looking at and interpretation of anthropometric, biochemical, clinical and dietary profile of patients.

2.17.3 Comprehensive assessment of nutritional status

2.17.3.1 Anthropometry
Nutritional anthropometry defined by Jelliffe (1989) and WHO (1995) involves “measurements of the variations of the physical dimensions and the gross composition of the human body at different age levels and degrees of nutrition.” Common measurements especially in the hospital setting include MUAC, height, weight and BMI. BMI indicates
the weight status and MUAC indicates subcutaneous fat which shows nutritional status of a person.

2.17.3.2 Biochemical profile

Biochemical tests reveal current nutritional status. With increasing knowledge of the metabolic functions of vitamins and minerals, assessment of nutritional status by clinical signs has given way to more precise biochemical tests which may be applied to measure individual nutrient concentration in body fluids (like serum retinol, serum iron, or detection of abnormal amounts of metabolites in urine frequently after a loading dose, or measurement of enzymes in which the vitamin is a known co-factor (for example in riboflavin deficiency) to help establish malnutrition in its preclinical stages. Haemoglobin estimation is the most important laboratory test that is carried out in nutrition surveys. Haemoglobin level is a useful index of the overall state of nutrition irrespective of its significance in anaemia. It is an important biochemical test carried out and RBC count and a haematocrit determination are valuable (Park, 2012).

2.17.3.3 Clinical Profile

Clinical examination is an essential feature of nutritional assessment since its ultimate objective is to assess levels of health of individuals or population groups in relation to the food they consume. It is the simplest and most practical method of ascertaining the nutritional status of a group of individuals (Park, 2012). For clinical data, physical signs of nutritional deficiencies, if any, related to eyes, hair, teeth, face and nails are assessed (Jelliffe, 1977). Essentially, assessment by clinical signs is based on examination for changes believed to be related to inadequate or excessive nutritional intake, that can be seen or felt in superficial epithelial tissues, especially the skin, hair, eyes, and mouth, or in organs near the surface of the body, such as thyroid, and the skull (craniotabes). It often includes signs to the local effect of the diet in the mouth rather than malnutrition like dental attrition and/or periodontal infection in adults. These may also be recorded because of their secondary nutritional consequences resulting from difficulties in chewing because of pain or loss of teeth (Jelliffe, 1977).
2.17.3.4 Dietary and Nutrient data

Dietary intake data may be assessed either by collecting retrospective intake data as with a 24 hour recall or food frequency questionnaire or summarizing prospective intake data, as with a food record kept for a number of days by an individual or the caretaker (Mahan and Stump, 2012).

The dietary and hence nutrient intake of patients along with their anthropometry, biochemical and clinical profile is essential for assessing their nutritional status. There are several methods for gathering dietary data, among which the 24 hour recall method is usually the most practical.

2.17.3.4.1 24 hour recall method

A nutritional assessment tool commonly used is the 24-hour dietary recall. The goal of the 24-hour dietary recall is to identify the day-to-day pattern of eating with a minimum of reporting bias. Thus, the method assesses the actual intake of individuals (Gibson and Ferguson, 1999). It is a recollective technique where the interviewer questions the respondent to name with approximate amounts the foods that were eaten during the previous day at each meal and in between meals. Although a 24 hour recall is generally repeated for 3 days-1 holiday and 2 working days (Zeman and Ney, 1996), in a hospital setting, a one day recall is more practical.

2.17.3.4.2 Food frequency questionnaire

Another assessment tool is the food frequency questionnaire, which is the quickest way to identify dietary patterns. Used in combination with the 24-hour recall, this is the best way to identify protective and detrimental components of the patient’s diet. The food frequency questionnaire will cover typical intake over a period of time usually one month (Tsugane et al, 1998) of green leafy vegetables, orange and yellow fruits for carotenoid intake (O’Neil et al, 2001) and milk and milk products for calcium intake (Barr et al, 2001). The FFQ helps to validate a 1 day recall by supplementing the information obtained from just one day’s diet.
2.17.3.5 Length of stay of hospitalised patients

The average length of stay (ALOS) is calculated by adding up the lengths of stay of all admitted patients in the hospital and dividing this by total number of discharges. Clinical teams mostly emphasize on early discharge, and attempts are made to reduce the lengths of stay, wherever possible. With available technology, minimally invasive procedures, day care treatments, and focus on lower complication rates, there is an opportunity to keep the average length of stay on the lower side. Admission and discharge criteria for critical care patients, guiding the decisions about stay in ICUs are beneficial for the patients as well as for the organization. However, all patients can not have a low length of stay, as their hospitalization may be longer, based on severity of illness, and recovery depends on many inherent factors. Monitoring and focusing on the length of stay is an important way of reviewing efficiencies and helps in planning patient related activities (MAX Health Care, 2012).

2.18 SANITATION AND HYGIENE IN THE KITCHEN

Food service establishments that prepare and provide food on a mass scale are important from the point of view of epidemiology of food borne diseases (Malhotra et al, 2007). Therefore, responsibility of the food service establishment is not only to serve attractive and nutritious food to patients, but also to ensure that it is wholesome and bacteriologically safe.

2.18.1 Assessment of surface hygiene

Over 30 years ago, a food safety program was developed at Rutgers University USA in response to food borne disease outbreak (Montville and Schaffner, 2004). Data on the microbial quality of food service, kitchen surfaces and ready-to eat foods were collected over a period of 10 years in Rutgers University dining halls. Surface bacterial counts, total aerobic plate counts, and total fecal coliform counts were determined using standard methods. Analysis was performed on foods tested more than 50 times (primarily lunch meats and deli salads) and on surfaces tested more than 500 times (36 different surface types, including pastry brushes, cutting boards, and countertops). Coliforms were most
commonly found in seafood salad (present in 61 samples) and least commonly found in coleslaw (present in only 7% of samples). Coliform counts (when present) were highest on average in shrimp salad. Average coliform counts in most products were typically between 1 and 2 log most probable number per gram. Fecal coliforms were not typically found in any deli salads or lunch meats.

An investigation, including environmental sampling, was undertaken by Kiddy et al, 1987 after four leukemic patients on the same hospital ward developed serious infections with Klebsiella aerogenes, capsular type K14. The source of this organism, common to all four patients, was found to be a food blender used for preparing milk-based drinks on the ward. Thus, randomized inspections of food service units in hospitals are an important tool in ensuring food safety.

### 2.18.2 Food distribution centres

Microbial quality of food depends on various aspects. The trolley/transportation being used to carry cooked/prepared food for serving should be dedicated for this purpose and should not carry anything else. Time required for transportation should be minimum to avoid microbial proliferation. Cooked food served hot should be kept at a temperature of at least 60°C to prevent microbial growth. Cooked food to be served cold should be kept below 5°C to prevent growth of pathogens. All foods during transportation must be kept covered and in such a way as to limit pathogen growth or toxin formation by controlling time of transportation, exposure, temperature control and using safe water for cleaning (Food Safety and Standards Regulations, 2009).

### 2.18.3 Microbiology of water

Half of the world's hospital beds are filled with people suffering from water related illnesses. Water should be stored hygienically in covered containers with taps for withdrawal. The water containers including water dispensers should be regularly emptied and cleaned and then dried by turning upside down at the end of the day’s work. Non potable water systems/containers should be identified and labelled. It should not connect
with, or allow refluxing into potable water supply (Food Safety and Standards Regulations, 2009).

**Safe Drinking water in hospitals**

As per (WHO, 2008), the purpose for which the water is to be used determines the criteria for water quality. The criteria for drinking water are usually not adequate for the medical uses of water. Drinking water should be safe for oral intake. Water is used in hospitals for many different uses. The water supply system should ensure the provision of safe water. The overhead storage tanks should be cleaned regularly and the quality of water should be sampled periodically to check for faecal contamination. Some microorganisms in the hospital have caused infection of wounds, respiratory tract and other areas where equipment such as endoscopes were rinsed with tap water after disinfection. Infection control teams should have written valid policies for water quality to minimize risk of infections due to water in hospitals.

Where safe water is not available, water should be boiled for five minutes to render it safe. Alternatively, water purification units can also be used. The storage of water should be as hygienic as possible. Hands should not enter the storage container. Water should be dispensed from the storage container by an outlet fitted with a closure device or tap. Storage containers and water coolers should be cleaned regularly (WHO, 2002).

**2.19 WASTE DISPOSAL**

Proper waste disposal is necessary to minimize chance of contamination and to prevent the development of off odours (Bhat and Nageshwara, 1992). The Government of India has made sure that all persons who generate, collect, receive, store, transport, treat, dispose or handle medical waste in any form, are responsible for handling the medical waste without any adverse effect to human health and the environment (Indian Society of Hospital Waste Management, 2010). Waste disposal (organic and other) is critical to keep food and beverage safe at every point of the chain. Waste at no point should come in
contact with the food directly or indirectly through flies or insects (Food Safety and Standard Authority of India, 2006).

General Waste includes general domestic type of waste from offices, public areas, stores, catering areas, comprising of newspapers, letters, documents, cardboard containers, metal cans, and floor sweepings and also includes kitchen waste. The bag or liner should be made of non-chlorinated plastics especially if it is to be incinerated. Alternatively, sturdy boxes with inner lining could be used, for example, cardboard boxes and latex lining or sturdy paper or draw sheet bags which are leak proof or having a lining of degradable wax or latex which may also prevent leakage effectively. General waste could be disposed off in ordinary cardboard boxes and kitchen wastes can be collected in sturdy containers without liners and later composted (Sharma and Mahajan, 2001).

2.20 DISHWASHING

Dishwashing is one of the most important tasks in food service establishment of hospitals. Unfortunately it is one aspect which is not given much consideration and is usually assigned to the lowest grade employees, who have little knowledge of sanitation. The three most important requirements for dishwashing besides running water are sinks, drain boards and detergent/washing agents (Roday, 1999).

Adequate equipment for cleaning and sterilizing utensils should be provided. Where a dish-washing machine is installed it should be worked efficiently and provide for thorough cleansing of utensils and for their sterilization. For hand washing of utensils, the minimal provision should be:

− a sink or sinks (according to the size of the establishment) for the washing of utensils, with hot and cold water.

− A separate sink or sinks for sterilizing, each furnished with its own supply or water which can be kept at a temperature of not less than 17°F, by steam injection or otherwise, with automatic devices for recording temperature. Sterilization in a steam chest if adequately carried out may be accepted as an alternative.
In a small establishment, two-compartment sinks for washing and sterilizing respectively may be used instead of two separate sinks, provided that the necessary device is available for recording the temperature. Sterilization can be effected by simple steaming in a suitable vessel also.

Additional requirements for cleaning and sterilization of dishes and equipment include metal racks with handles to hold utensils for immersion in the sterilizing sink. There should be adequate shelves, hooks or racks to receive utensils for air drying. There should be reserves of glass, crockery and cutlery to ensure the prompt replacement of chipped, cracked or bent equipment. During rush hours, inadequately sterilized equipment should not be used. Detergents used in connection with utensil cleansing should be suitable for the conditions existing, and should be used in correct strength. The local authority is consulted as to the appropriate detergents to use.

2.20.1 Dish Washing Steps suggested by DGHS (1989) are

- Collect all soiled dishes/vessels
- Empty dishes/vessels
- Soak in water and wash clean with soap/cleaning agent provided
- Rinse in hot water
- Stack to dry.

2.21 CLEANLINESS OF INFRASTRUCTURE AND WORK PREMISES

DGHS (1989) has also given guidelines for infrastructure, work premises and usage of equipment, towards maintenance of cleanliness in the kitchen area. These are:

2.21.1 Infrastructure

- Adequate and suitable covered receptacles of impervious material should be provided for refuse, food scraps and the like with a suitable and sufficient storage place for them outside all food-preparation rooms.
There should be proper receptacles constructed of impervious material for all foods broken down from bulk. All except those for vegetables should have covers.

There should be a cool larder of adequate size for the storage of foods particularly those of a perishable nature.

The surface of tables and benches should be impervious to liquids and without open cracks.

There should be separate and adequate storage for all utensils and, in particular, covered racks for crockery, trays for cutlery and suitable shelving for saucepans and small cooking vessels.

There should be a separate sink or sinks for vegetable preparation.

Ventilated hoods, or adequate alternative means for the removal of steam, fumes, intense heat from grillers should be provided, wherever required.

**2.21.2 Work Premises and Method of Work**

Besides personal hygiene, DGHS has also laid down norms for working premises and method of work to ensure hygiene and sanitation.

The premises and fixtures should be constructed and fitted such that all parts of both premises and fixtures are capable of being readily cleaned

Premises: The premises should be large enough for orderly sequence of work without undue crossing of traffic line

Cooking equipment: The cooking equipment should be so placed that wall areas adjacent thereto and the equipment itself are readily accessible for cleaning

Floors: The floors should be free from cracks, without open joints, impervious, non-slip and capable of being easily washed down. They should slope evenly towards the drainage outlet

Walls: The walls should be substantial, durable, smooth, impervious, washable and of a light colour such as white tiles Terraso or polished Kotah

Ceilings: The ceilings should be dust proof and free from cracks

Repair: All premises should be maintained in sound repair and every precaution taken against infestation from vermin
Drainage: Gullies outside and in close proximity should be trapped. All yards should have impervious and even surfaces and should be properly drained.

Water supply: An adequate supply of wholesome water piped to taps over sinks, lavatory/basins and other appropriate fixed receptacles should be provided.

Hot water: Apparatus to provide hot water up to at least 170°F for all requisite purposes should be installed.

Lighting: All parts of the premises used for food preparation should be adequately lit, preferably both by natural light and by artificial light.

Ventilation: Adequate ventilation should be provided. Here a system of artificial ventilation is not installed but an adequate flow of fresh air should be maintained.

Cloak room: Clean and adequate cloak-room accommodation should be provided for the staff, distinct from but preferably adjacent to the food-preparation rooms.

Sanitary conveniences: There should be a sufficient number of sanitary conveniences to meet the needs of the staff. It should be well lit, ventilated and kept clean.

Washing facilities: There should be a sufficient number of wash-basins in immediate proximity to the sanitary conveniences, and elsewhere as may be necessary, to meet the needs of the staff. In addition, a wash-basin should be fixed in the kitchen itself, or immediately adjacent thereto. Kitchen sinks should not be used for hand washing. All wash-basins should be well lit, with hot and cold water laid on, and should be kept clean. Soap, nail brushes and towels should be provided.

These steps facilitate maintenance of good hygiene and sanitation in the kitchen area and also offer some protection against infestation from rodents and flies.

2.21.3 Vermin and Flies

For pest control, DGHS (1989) has laid down guidelines. These are
Rats and Mice: Infestation by rats and mice is dangerous as they can spread infection to man. All practicable steps should be taken to eliminate this source of infection. It is essential:
(a) to maintain the premises in good repair and to stop all ascertainable means of rodent access
(b) to ensure that all food scraps are promptly removed and the premises maintained at a high level of cleanliness
(c) to provide impervious receptacles with tightly fitting covers for the storage of all foods attractive to rodent
(d) To consult and seek the help of the local authority if rats or mice are found in substantial numbers.

*Flies, cockroaches and other insects:* The number of flies on the premises can be materially reduced by the rapid and efficient disposal of all food scraps and by using fly-proof covers for food to the fullest possible extent. Manure or refuse piles or other materials serving for fly breeding near to the catering establishment should be reported to the local authority. The presence of cockroaches and other insects in numbers is often evidence of faulty fixing of plant and of inadequate hygienic practices. Thorough cleanliness and the provision of proper food containers are important preventive measures. The local authority should be consulted if the presence of these pests continues. When insecticides are used, great care should be taken to prevent the contamination of food, equipment and utensils.

### 2.22 PERSONAL HYGIENE PRACTICES

The hygiene and health of all persons who prepare/serve food (food handlers) is essential to keep food safe (Food Safety and Standards Authority of India, 2006). Foods do not cause illness; bacteria and other pathogens do. However, raw foods of animal origin meat, poultry, eggs, fish, and shellfish-frequently are contaminated with bacteria common in the food chain. In other cases, healthy food handlers may contaminate food with bacteria common in the human body, or diseased food handlers may contaminate food
with lesser common pathogens. Food service operations are frequently identified as places where mishandling of foods has led to outbreaks of food borne diseases (Bryan, 1990). There is a wide range of potentially toxic agents causing food-borne diseases posing problems with respect to food safety. These include: bacteria and bacterial toxins; zoonotic parasites; fungi and fungal toxins; aquatic bio toxins; plant toxins; pesticide residues; heavy metals; veterinary drug residues; food adulterants; certain food additives; nitrates, nitrites and nitrosamines. The most commonly involved foods are meat and meat products, poultry, eggs, milk and milk products, sweetmeats and rice preparations. Food handlers are a major contributing factor in the causation of food borne diseases.

A food handler is anyone who works in a food service unit and who either handles food or surfaces that are likely to be in contact with food such as cutlery, plates and bowls. A food handler may do many different things for a food business. Examples include making, cooking, preparing, serving, packing, displaying and storing food. Food handlers are also involved in manufacturing, producing, collecting, extracting, processing, transporting, delivering, thawing or preserving food. Food handlers working in food service establishments have been identified as an important source for contamination of food and food borne disease outbreaks (Girish et al, 2002).

In view of the significance of hygiene and health of food handlers in hospitals DGHS (1989), has defined the personal and general hygiene code for food handlers.

2.22.1 Food Handler Personal General Hygiene Codes (DGHS, 1989)

2.22.1.1 Practicing personal hygiene

- Knowing when and how to wash hands properly.
- Wearing clean clothing.
- Maintaining good personal habits (bathing, washing and restraining hair, keeping fingernails short and clean, washing hands after using toilet)
- Maintaining good health and reporting when sick to avoid spreading of possible infections.
✓ Wash hands frequently and particularly after visiting the toilet and before handling food.
✓ Do not touch food with hands more than is absolutely necessary.
✓ Cover cuts, burns and other raw surfaces with waterproof dressings while handling food.
✓ Keep food cold during storage, particularly cooked meat dishes, gravies and preparations with cream.
✓ Protect food from flies, rats, mice and other pests.
✓ Every applicant for employment should be informed of the possible risk from previous attacks of typhoid fever or paratyphoid fever and should be asked if he (or she) has previously suffered from one of these diseases. If he (or she) has so suffered, particulars should be reported to the Medical Officer of Health and the applicant not engaged until approval has been given by the Medical Officer of Health.

Adherence to the hygienic requirements in this code alone is not enough. It is of prime importance that these steps should be inbuilt in the staff and all members of the staff (management and workers) continually practice the principles of sound personal hygiene. They should also take full advantage of any suitable courses of instruction which are available.

2.22.1.2 Personnel hygiene instructions to the kitchen staff (DGHS, 1989)

DGHS (1989) has provided guidelines for personnel hygiene of kitchen workers in hospitals
✓ Personal appearance should be neat and clean
✓ Dress - Clean uniforms, caps and aprons must be worn during the working hours
✓ Personal belongings such as coats, shoes should be kept in the place provided for that purpose
✓ Hands and finger nails should be clean before beginning work
✓ Touching face, hair while cooking should be avoided if necessary, hands should be washed at once.
For implementation of the personal and general hygiene code recommended by DGHS (1989), the following precautions are also suggested

✓ Motivate, educate, encourage and most importantly supervise employees, to stop handling food when they get infected and develop jaundice, diarrhoea, vomiting, fever, sore throat, eye, nose or ear discharge and skin problems.
✓ Food handlers should wear clean and proper clothing. They should cover hair and wear hand gloves while handling food.
✓ Street shoes inside the food preparation area should not be worn while handling and preparing food.
✓ Personal belongings should be kept away from food and food contact surfaces.
✓ Hand washing facilities should be available at the outlet along with continuous supply of water, soap and tissue roll/paper towel/hand dryer or hand sanitizer.
✓ Hand washing is critical for all food handlers using soap and water. Thorough washing under running water needs to be ensured before and after handling food and especially after using toilets, handling garbage, touching animals, touching raw food of animal origin, touching toxic substances like cleaners, pesticides and disinfectants.
✓ Members of the staff should report to the supervisor if they are suffering from any of the conditions already specified or of any other illness.
✓ In the case of the other illness, if there is a doubt whether the employee should continue to work, the employee should be referred to his (or her) doctor pending resumption of work.

2.22.1.3 Importance of hand washing

The U.S. Center for Disease Control and Prevention has stated strongly "hand washing is the single most important means of preventing the spread of infection." This holds true for processing plants, restaurants, households and hospitals. It is the one step that stands between outbreak and safety." It is also important to root out hazardous activities that require workers to plunge hands directly into food (Center of Disease and Control, 1998).
Handling and preparing foods with hand contact is a common way to transfer food borne hazards to and from foods. It is important to ensure that the hands of a food handler are kept clean before, during, and after handling foods. Hands should be washed after the following activities described below:

- After touching bare human body parts.
- After using the restroom.
- After handling animals.
- After coughing, sneezing, touching hair, eyes or mouth, using a tissue, using tobacco, eating, or drinking.
- After handling soiled equipment or utensils.
- Before food preparation.
- During food preparation
- When switching between raw foods and ready-to-eat foods
- After engaging in any activity that may contaminate hands.

Dumavibhat et al (1989) reported that each food handler harboured before washing hands, one to eight bacterial species. After hand washing with soap, disappearance of one to four bacterial strains on hands and nails were found in 47.6% of food handlers. Sterilization of skin is totally impossible. Washing of hand with soap and water is the only hygienic treatment in most of the cases. Lack of conviction about necessity of good personal hygiene causes people to be negligent. It was observed that only 14% of people use soap for washing their hands (UNICEF, 1990).

As food handlers have control over the health of millions of people, they carry heavy responsibilities for the well-being of the people they serve. Their interest in sanitation and cooperative attitude are of extreme importance in practicing sanitation (Longree, 1982).

2.23 FOOD SAFETY

A study was conducted by Buccheri et al, (2007). The purpose of this study was to evaluate knowledge, attitudes, and practices concerning food safety of the nursing staff of
two hospitals in Palenno, Italy. Association with some demographic and work-related
determinants was also investigated. Overall, 401 nurses, 279 (37.1%) of the General
Hospitals and 122 (53.5%) of the Paediatric Hospitals, respectively, answered. Among
the respondents there was a generalized lack of knowledge about etiologic agents and
food vehicles associated to food borne diseases and proper temperatures of storage of hot
and cold ready to eat foods. A general positive attitude towards temperature control and
using clothing and gloves, when handling food, was shared by the respondents nurses, but
questions about cross contamination, refreezing and handling unwrapped food with cuts
or abrasions on hands were frequently answered incorrectly. The practice section
performed better, though sharing of utensils for raw and uncooked foods and thawing of
frozen foods at room temperatures proved to be widely frequent among the respondents.
Age, gender, educational level and length of service were inconsistently associated with
the answer pattern. More than 80% of the respondent nurses did not attend any
educational course on food hygiene. Those who attended at least one training course
fared significantly better about some knowledge issues, but no difference was detected in
both the attitude and practice sections. Safer management of catering in the hospitals are
needed, where non professional food handlers, like nursing or domestic staff, are
involved in food service functions.

Microbiological quality is often a prime concern relating to food safety; yet
microbiological specifications are conspicuous by their absence in India (Aiyar, 2001). The
majority of health problems that are emerging the world over are due to the consumption
of food contaminated with pathogens or microbial spoilt foods. About 20% of the world's
food supply was lost due to microbial spoilage as estimated over two decades ago
(Raghuramaiah, 2003).

2.23.1 Food Safety in Food Service Establishments
Food safety is something that we try to achieve by ensuring food hygiene. Food hygiene
as defined by the Codex Alimentarious Commission (CAC) includes all conditions and
measures necessary to ensure safety and stability of food at all stages of food chain. Food
safety is defined by the CAC as assurance that food will not cause harm to the consumer when it is prepared and or eaten according to the intended use.

To achieve food safety, three levels of hygiene measures can be implemented. This includes the general principles of food hygiene, as stipulated by the Codex Code. These principles lay the foundation of food safety. Additional hygienic requirements for particular food sector are described in specific codes of manufacturing or hygienic practices (GMP/GHP). These two types of requirements, often prescribed in codes by food laws and regulations, form the basis for good manufacturing hygienic practices. These codes also cover requirements for nutritional and other properties of food. Proper flow of food is very essential in every food establishment to prevent any food hazard. The flow of food begins with receiving and storage. From storage, food products move into the preparation and service phases, which involve one or more steps (Swane et al, 2003). Therefore to prevent any food hazard, preventive measures include preventing or minimizing contamination of foods, killing microbial contamination or denaturing toxins and inhibiting growth of pathogenic microorganisms in foods. These measures can be accomplished with high degree of assurance through application of Hazard Analysis Critical Control Point (HACCP) System to food service operations (Bryan, 1990).

In a study on microbiological assessment of foods collected from hospitals at Dhaka city, Rabbi et al, (2011) states that hospitals are in general thought to be the most hygienic place. However, a poorly run hospital can be responsible for any sort of food-borne illnesses and hence can serve as a reservoir of pathogens. The role of food stuffs, contaminated by potentially pathogenic bacteria, has long been established as one of the most common causes of gastroenteritis, but the control of this condition remains a major public health problem in all communities. The importance of safe food for hospitalized patients and the detrimental effect that contaminated food could have on their recovery has been emphasized (Kandela, 1999). Patients receiving foods from a single kitchen with poor food handling practices could suffer a food borne infection which could result in an outbreak involving the whole hospital (Ayliffe, 1992). Outbreaks of food borne
infection in hospitals are associated with high attack rates and disruption of services (Maguire et al, 2000).

2.24 TRAINING AND EDUCATION PROGRAMMES ON SANITATION AND HYGIENE IN HOSPITALS

In 2003, the Council of Europe decided to collect information regarding nutrition programmes in hospitals and for this purpose a network consisting of national experts from eight of the Partial Agreement member states was established. The aim was to review the current practice in Europe regarding hospital food provision, to highlight deficiencies and to issue guidelines to improve the nutritional care and support of hospitalized patients. Five major problems seemed to be common in this context: 1) lack of clearly defined responsibilities; 2) lack of sufficient education; 3) lack of influence of the patients; 4) lack of co-operation among all staff groups; and 5) lack of involvement from the hospital management. To solve the problems highlighted, a combined 'team-effort' was needed from national authorities and all staff involved in the nutritional care and support, including hospital managers (Beck et al, 2001).

Hospitals and patients are provided with necessary information to make decisions based upon a sound scientific basis. Failure to do so allows ignorance, taboos and traditional belief to dictate their behaviour and practices. The competence of personnel involved in food control is essential. Education of the food service personnel in various aspects of hygiene have been recommended as a means of improving food handling practices and thus the safety of food (Rennie, 1995).

Information on food safety awareness should be supported by lectures, demonstrations, slides, audiovisual aids and posters and by presentation and translation of all relevant regulations. Standards of basic food safety should be in the respective vernacular language and the material presentation should be straightforward and factually correct (Chakarvarthy, 1995).