Chapter 1

Introduction

This chapter deals with the global and Indian situation about cancer in general and with breast and cervix cancer in particular. Cancer control & prevention and the role of Information and Communication Technology marks the second section of this chapter followed by clinical decision support system and its need in healthcare setting. The chapter ends with a detailed list of Objectives and Significance of this Research.

“In an era when today’s truths become tomorrow’s outdated concept, an individual who is unable to gather pertinent information is almost as helpless as those who are unable to read and write” [1] (Breivik & Gee, 1989)

1.1 Cancer

Cancer is a class of disease with uncontrolled growths; invasion and sometimes metastasis caused by certain abnormalities in the genetic and transformed cells [2].
1.2 Global Situation About Cancer

Cancer is considered to be one of the leading causes of deaths worldwide. As per the world cancer report 2008, there were 12.4 million cancer incidences and 7.6 million deaths worldwide. The most common cancers in terms of incidence were those of lungs, breasts and colorectal cancer whereas maximum deaths were reported due to lung, stomach and liver cancer. It is also estimated that the number of incidences and deaths will reach 20.0 million and 12.9 million respectively by 2030 with no changes in the current rate, whereas with 1% annual increase of rates the number will become 26.4 million and 17.0 million respectively [3].

1.2.1 Breast Cancer

Breast cancer is a malignant tumor that starts from the cells of the breast [3]. It is known to be one of the ten leading causes of death among women worldwide accounting for 1.3 million new cases annually. Five year survival rate from breast cancer is about 89% in the United States and 76% in Europe. Survival rate in developing countries is generally lower than in Europe and America [4].

1.2.2 Cervix Cancer

Cervical Cancer is the second most common cancer among women worldwide with an estimated 529,409 new cases and 274,883 deaths in 2008. About 86% of the cases occurred in developing countries representing 13% of female cancer. In India, there are about 366.58 millions of women at risk of cervical cancer with 1,34,420 new cases and 72,825 deaths reported annually. An estimated 2,03,757 new cases as well as 1,15,171 deaths are projected by the year 2025 [5].
1.3 Role of Information & Communication Technology in Oncology

Cancer control and prevention is an integral part of the healthcare system and a challenging task. Its aim is to reduce the incidence, mortality and morbidity of care and to improve the quality of life of the patient suffering from cancer [6]. Accurate, adequate, complete and timely health information and clinical knowledge plays a vital role in accomplishing this aim by making quality decision during patient encounter.

The adoption of as per the changing trends information and communication technology (I&CT) in healthcare settings has equipped the modern healthcare providers with the mechanism to deal more effectively with the challenges associated with the accessing of information and clinical knowledge from the large dataset for enhancing the quality of healthcare.

Over the last few decades, the computing system has become increasingly common in health care setting in providing quality care and in facilitating better medical decision making. Initially, they were used for administrative and financial purposes - a role that continues even today - but the use of the computer system in clinical decision making is growing now a days.

Information and Communication is acknowledged as a potential method of improving the care of the cancer patient [7]. The new computer technology facilitate or enhance communication and exchange of information between the cancer patients and the care providers resulting in the benefit for both at the same time. Such technologies have the potential to save time and money, increase convenience and choices, obtain timely information, and reduce the stigma associated with the cancer care [8].
### 1.4 Clinical Decision Support System

Clinical decision making is the formulation of diagnosis based on information gathered from the patient and other sources [9]. As one of the important applications of I& CT, CDSS aids clinicians in gathering all of types information related to the patient as well as the knowledge related to the respective domain required for making diagnostic and therapeutic decision. The system also supports clinical coding and documentation, authorization of procedure, referral, clinical diagnosis, treatment plan process, condition-specific guidelines and promoting the use of best practice [10].

Clinical Decision support system is the provision of clinical knowledge and patient-related information, intelligently filtered or presented at appropriate times, to improve enhance patient care. It has the potential to minimize practice variation and improve patient care and create a marked surface throughout the healthcare industry [11]. It also assists in management of various other activities such as referral services, diagnosis, classification and staging, treatment and follow-up of the patient with specific neoplastic disease. The system also facilitates continuous monitoring of the patient while providing palliative as well as curative care. It is important to notice that the system is meant to support the clinician in medical decision making and not to relieve him of medical practice.

### 1.5 Need of Clinical Decision Support System in Cancer Care

Cancer care and care evaluation require a dedicated clinical decision support system to improve the patient safety by reducing medical error and adverse
results due to drug contraindication. It has the potential to improve the cancer care by providing instant and up-to-date patient information and domain knowledge that result in increasing the healthcare professional’s available time for direct patient care and evaluation. The system has the capability to enhance the efficiency in healthcare delivery system by suggesting the line of treatment for patient care and reducing the cost through e-prescribing support and also with the reduction in duplication of tests [12].

1.6 Motivation for the Study

The recent trends in healthcare shows the necessity for innovative and dependable clinical information systems with decision support capabilities for quality decision making in healthcare delivery system. This research domain comprises the design and development of a customized clinical decision support system for breast and cervix cancer care to assist the clinicians with patient information and domain knowledge for quality decision making and also to promote evidence based practice.

1.7 Research Objectives

Quality Decision Making is one of the most important aspects in patient care where clinical decision support system assists the healthcare professional in accomplishing it. There are many barriers which hinder the acceptability and sustainability of such system for a long run in healthcare practice. Nair [13] has identified that the dependence on electronic health record, lack of computer literacy skill among end users and lack of availability of updated clinical knowledge marked the failure of clinical decision support system. Kawamoto et al. (2005) [14] also noted that the provision of evidence for quality decision
during patient care forms a basis for the successful implementation of clinical
decision support system in practice. Sim et. al. [15] have suggested that clinical
decision support systems should not only be evidence based but also “evidence
adaptive” to provide updated knowledge and most recent advances in clinical
science.

The research objectives had been formulated based on the above finding
to successfully accomplish the aim of designing and developing a customized
decision support for breast and cervix cancer. The objectives included
were:

Objective.1. To Identify the various clinical decision support sys-
tems available in practice.
Rationale: To learn and understand the features and limitation with the ex-
isting system and address the issues during the design and implementation of
the systems.

Objective.2. Understand the present level of knowledge among
Oncologists with regard to information systems.
Rationale: Knowledge of information systems plays a vital role in accept-
ability and sustainability of an IT application in a hospital setup and also
contributes in improving the work performance of the healthcare profession-
als [16–20].

Objective.3. Assess the utilization of existing information system
among the oncologists.
Rationale: The effective and efficient utilization of IT application enhances
the clinician’s performances in healthcare delivery system and the assessment
of utilization of existing system among will help to understand the clinician’s
ability to use the information system for quality decision making [20–23].

Objective.4. Identify the Oncologists opinion on clinical decision
support system.

Rationale: The acceptability of any information system in the healthcare setup depends on the positive attitude of the clinicians to use it for the quality decision making in patient care [18,21,24–26]. The assessment of opinion will help in identifying factors to be considered during the implementation of the system.

Objective.5. Understand the Oncologists expectation from the clinical decision support system.

Rationale: As the clinicians’ are the end users and understanding their expectation with regard to clinical decision support system will help in choosing the appropriate content and tool for the development of the system [27,28].

Objective.6. Design and Develop a Customized Decision Support System for Breast and Cervix Cancer.

Rationale: To Improve the accessibility and availability of patient information and clinical knowledge for faster and more efficient and productive use.

1.8 Significance of the Research

Changing trends of healthcare practice and increase in healthcare cost makes it imperative that healthcare professionals should make an optimal decision to improve the quality and safety of patient care. Clinical decision support system is generally targeted as a tool for quality, risk mitigation, productivity and profitability outcome of hospitals [29].

In view of the above fact, the significance of conducting this research investigation is to provide a simplified solution to the Oncologist in

1.8.1 Accessing, recording and updating the events occurring in care of patient with the minimal time where they can utilize maxi-
mum time for patient care.

1.8.2 Improving the clinical coding, cancer staging, follow-up events and tracking the performance status of the patient.

1.8.3 Managing clinical complexity with the available online and offline clinical knowledge in relation to cancer in general and with specific reference to breast and cervix cancer.

1.8.4 Dynamically updating the clinical knowledge in relation to breast and cervix cancer.

1.8.5 Enhancing multidisciplinary communication.

1.8.6 Generating various tools of statistical analysis and presentation for cancer control and prevention program and national cancer registry reporting.

1.9 Keywords

- **Decision support System**: An interactive, flexible and adaptable computer based information system that utilizes decision rules, models and a model base coupled with a comprehensive database and the decision-maker’s own insight [30].

- **Oncology**: The branch of medicine that deals with tumors, including study of their development, diagnosis, treatment and prevention [31].

- **Awareness**: Awareness is the state or ability to perceive, to feel, or to be conscious of events, objects or sensory patterns [32].