**7.2.1: Describe two best practices successfully implemented by the Institution as per NAAC format provided in the Manual.**

**BEST PRACTICE-I**

**Title of the Practice**

To make available the extensive and unique experimental facilities available with DAE Institutions for advanced research by HBNI students and faculty and also other Research Institutions/Universities

**Objectives of the Practice**

The CIs/OCC of HBNI have unique, state-of-the art research facilities, such as nuclear reactors, accelerators, etc. HBNI aims to advance indigenous nuclear technological capability by making available these research facilities to the young research students. The experimental facilities are also extended to students of other Universities, with the twin objectives of enhancing the utilisation of the national facilities and aiding the development of human resources for the country.

**The Context**

DAE is pursuing indigenous development of materials, equipment, processes, systems and mega science facilities relevant to nuclear science and technology. Such a program involves challenging experiments such as measurement of properties of radioactive fuel, degradation of structural materials subjected to irradiation, production of radiopharmaceuticals, enrichment of nuclear fuel materials, radiation applications, etc. DAE has set up a wide variety of unique experimental facilities to address these R & D requirements, which are of high value, not only with regard to research on topics related to nuclear sciences, but also several other domains of science and technology.

**The Practice**

HBNI encourages faculty and students to take up research programs that make use of the immense experimental facilities available within DAE units. Apart from state of the art High Performance computing facilities, DAE has laboratories to cater to major experimental research activities in various disciplines. Some of the unique experimental facilities available are research

reactors, accelerators, tokamaks, synchrotron, neutron spectrometers, large telescopes, laboratories for experiments with ultrapure / reactive/ radioactive materials, high temperature sodium test facilities, shake table for seismic simulations, facilities to study materials under extreme conditions, etc. Other advanced experimental facilities available in the CIs/OCC include crystal growth facilities, spectroscopic facilities, ultrafast chemistry, thin film deposition, plasma processing, laboratories for stress analysis, robotics and remote handling, electromagnetic forming/welding equipment, etc. The students of HBNI from various CIs/OCC have access to such unique and complex experimental facilities and thus develop unique expertise in challenging experimentation. DAE also participates in international collaborative ventures, viz. LHC, ITER, FAIR, Project X of Fermi Lab, LIGO, etc. Several HBNI students have the privilege of working with international teams on experiments, computations and instrumentation development related to these projects.

DAE units also make available the large experimental facilities to students from other organisations / universities, through a UGC-DAE consortium. The beamlines available at Indus synchrotron facilities at RRCAT are routinely used by researchers from other Universities. At BARC, university scientists and students are provided access to the National Facility for Neutron Beam Research (NFNBR) at Dhruva reactor. The Kolkata Center of the Consortium coordinates accelerator based experimental work, both in-beam and offline at the VECC and the 3 MV Pelletron at IoP. The Kalpakkam node provides access to the sophisticated scientific equipment of IGCAR for the university researchers. HBNI faculty are deeply involved in the collaboration programs pursued in these facilities.

**Evidence of Success**

The research problems selected by HBNI students have direct bearing on the ongoing programs of the department. The result of this is that the students get opportunities to work on sophisticated experimental facilities and their work gets published in high impact journals. At the same time, DAE gets valuable research inputs for the projects which are a part of its mission. It has been observed that more than 40% of the PhD dissertations involve experimental work using DAE facilities. The utilisation of the Indus synchrotron and other facilities by researchers across the country has continued to increase over time, producing excellent results in several domains of science. These are all evidences of success of such best practice.

**Problems Encountered and Resources Required**

The experimental facilities available in DAE units are under high level of security as they are considered as strategic installations. Use of some facilities involve handling of radioactive

elements. Access to such facilities by students needs formal permissions and special training. Similarly, facilities are shared by many researchers at a time and students need to wait for getting access. These factors may lead to time pressure on completion of the academic program, in comparison to conventional universities. No difficulty has however, been encountered in terms of availability of funds to carry out research and payment of fellowships to the students, since such funds are provided by DAE as a part of their regular annual budget.

**Best Practice – II**

**Title of the Practice**

Capacity building in cancer treatment to meet national needs

**Objectives of the Practice**

One of the mandates of HBNI is to engage in the development and delivery of academic programs that can make significant impact on the society. With the growing incidence of cancers in India, there is an acute need to develop appropriate infrastructure and trained manpower for optimal delivery of quality cancer care in the country. The objective of the practice is to use academic programs as a tool to enhance the number of specialists to meet the growing requirements of cancer care in the country.

**The Context**

The annual Cancer incidence in India is approximately 1.1 million and this is expected to increase to 1.7 million cases by 2035. In India, there is a significant shortfall of trained manpower for cancer care and this gap is likely to increase further in future. Therefore, there is an urgent need to enhance the number of highly professional medical doctors, to provide relief to the patients, and also pursue innovative research towards understanding, avoiding and treating cancer. Such medical professionals will also provide leadership for guiding the national policy and strategy for cancer care and education to future students, hospital employees and public.

**The Practice**

Education and research in the area of oncology is primarily being pursued at Tata Medical Centre (TMC), which is one of the CIs of HBNI. It has a hospital called Tata Memorial Hospital (TMH) and a research centre called Advanced Centre for Treatment, Research and Education in Cancer (ACTREC). In TMH, MD post graduate programs are being pursued in eight specialised areas of Oncology. Similarly, DM and MCh programs are offered in ten super-speciality subjects, covering almost every important organ of the body.

In addition, six new PG programs have been started since 2006 under Health and Medical Board of Studies. These are M.Sc. (Nursing), M.Sc. (Clinical Research), M.Sc. (Nuclear Medicine and Molecular Imaging technology), M.Sc. (Public Health in Epidemiology), M.Sc. (Occupational Therapy in Oncology) and PG Diploma in Fusion Imaging Technology. These programs have helped in developing human resources in several allied domains of relevance to cancer research and treatment.

HBNI is also pursuing PhD programs in cancer research. During 2018-2019, twenty-seven students from HBNI completed their PhD programs in this area. In addition, twenty-two specialised two-year certified fellowship programs related to cancer treatment in specific organs have been started to meet ever growing requirements of manpower in this area.

To promote research in cancer, the TMH has well equipped laboratories and a cancer Research Secretariat. At ACTREC, each of the Principal Investigators have their own full-fledged research labs equipped with most advanced experimental facilities. ACTREC also maintains vital research support facilities like Radioisotope room, Bacteriology room, Animal Facility for work involving experimental animals, Biorepository of tumour tissues required for research, Anti-Cancer Drug Screening facility, Tissue Culture facility, etc.

**Evidence of Success**

At the time of inception of HBNI in 2005, the total number of MD, DM and MCh seats available at TMC was merely 25. Presently, TMC has 79 MD, 30 DM and 34 MCh seats per year. The number of students passed out in 2010-2011 in MD, DM and MCh programs was 4 and the same number in 2018-2019 is 110. Total number of PhD thesis completed till March 31, 2019 in the area of cancer research is 91. Students passing out of associated M.Sc. programs listed above, are also very useful to the society in the area of cancer treatment, education and research.

The success of the academic program is evident from the fact that practically 70% of the oncology manpower in the country has been trained at sometime within these environs. It is a matter of great pride that oncologists educated in TMC are contributing immensely in the fight against cancer in India and abroad.

**Problems Encountered and Resources Required**

No difficulty has been encountered regarding availability of funds to carry out research and payment of fellowships to the students. Such funds are provided by DAE as a part of its regular annual budget. With the rapidly expanding scope and numbers of the academic program at TMC, there is also a significant increase in the facilities/ infrastructure required for maintaining and further improving the academic programs. It is essential to increase manpower in the academic cell of TMC as well as in the central office of HBNI to handle academic records of constantly increasing number of medical and health science students.