Evolution and Challenges with Designing Clinical Engineering Informatics Systems in Developing Countries

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Abstract—Medical equipment is a critical component for delivery of healthcare diagnoses and treatment. Disease burden has further enhanced the need for early detection and intervention for disease prevention & management. Unfortunately in developing countries, the portfolio of medical equipment is erratic with little emphasis on maintenance, contributing to lack of service deliverability and increased total cost. India is a country with approximately 16.5% of the world’s population and a rift among private and public health facilities. With 20% of the population below poverty line, it becomes all the more important to ensure that public health facilities deliver the services to cater such a huge population.

I. INTRODUCTION

The National Health Systems Resource Center (NHSRC) is a technical institute within the Ministry of Health and Family Welfare (MOHFW) India, to identify problems and provide solutions. In NHSRC, divisions looking at various aspects of healthcare systems range from Healthcare Technology (HT) to financing. The HT Division (HTC) is responsible for MOHFW Clinical Engineering (CE)1.

II. DATA COLLECTION AND HUMAN RESOURCES

To address medical equipment maintenance, it is important to have details of the device inventory mapping along with availability of dedicated CE manpower for the upkeep. Due to lack of manpower in India, it becomes impossible to maintain CE infrastructure in-house. The current solution lies in engagement of the private sector through PPP (Public Private Partnership) model for services and upkeep. The PPP engagement involves three stages:

1. Inventory mapping: asset identification and tagging
2. Tendering and award of contract
3. Implementation and monitoring of contract

At every stage of the maintenance program, a robust IT infrastructure (CE Informatics System, or CE IS) is essential to ensure capturing of vital information for engagement and monitoring of the PPP module, and HT management (HTM).

III. INVENTORY MAPPING

The most daunting task in management and maintenance of equipment is inventory mapping, especially in India, due to lack of robust IS. It is essential that all equipment is tagged and information is centrally stored in the IS to plan and foresee CE lifecycle activity.

IV. CONTRACT MONITORING AND HTM

Implementation and monitoring of maintenance services is highly dependent on IS infrastructure, with dashboards and daily monitoring to ensure that the Key Performance Indicators and equipment up-time are maintained. Other HTM activities, e.g., availability of spare parts, replacement equipment, and interfacing with government software for auditing of invoices and payments through a CE IS2, is also important. NHSRC’s CE IS parallels other key HCT HTM work in providing device technical specifications for:

1. Operational Theatres; (2) Neonatal-Pediatric Care ICUs;
3. Laboratory and Radiology; (4) Special Neonatal Care Unit; and (5) India’s National Guard Security Program.

V. CONCLUSIONS

As life of medical equipment ranges from 5-10 years in most cases, and purchase cost contributes only 20% of total lifecycle expenditure3, CE IS data can be used to formulate decision-making criteria for manufacturer reliability, when equipment upgrade is needed, and when obsolete. Careful consideration of all lifecycle costs is essential to hospital management in determining the most appropriate equipment especially maintenance and calibration for its lifecycle.

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REFERENCES

[1] CE definition: http://acacen.org/about/Pages/ClinicalEngineer.aspx

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