

INFORMATION PAPER

BIOMEDICAL ENGINEERING SERVICES IN PAPUA NEW GUINEA

1. BACKGROUND

The Biomedical Engineering Services in Papua New Guinea commenced in the 1970s with an x-ray equipment workshop at the Port Moresby General Hospital (PMGH). Two Radiographers were trained in New Zealand under the sponsorship of the New Zealand Government in 1984. A proper Biomedical Engineering Workshop was established in 1985 at PMGH by the two pioneer biomedical technicians after graduating from New Zealand. All the provincial hospitals around the country were supported from the PMGH Biomedical Engineering workshop.

In 1999, a total of 21 Biomedical Technicians from 18 Provincial Hospitals and PMGH were trained and graduated with New South Wales TAFE certificates in Biomedical Engineering Technology. A further 11 Biomedical Engineering Technicians/Engineers were trained from 2011-2013 at the Dallas Elizabeth Dahan Humanitarian Biomedical Engineering Training Centre, Dallas, Texas, USA sponsored by Exxon Mobil. Since 2018, the Government of Japan through JICA program has been providing ongoing 3 months short courses on Biomedical Equipment Maintenance for Biomedical Engineers and Technicians in Japan.

Health Service Delivery in PNG is mandated by strong Government Legislations, Policies and Health Services Standards. The PNG National Health Service Standards defines the services and role delineation for each level of healthcare facilities from lowest level 1 (Village aid post) to level 6, the national specialist referral teaching and research in Port Moresby. There are total of 4,582 healthcare facilities in PNG with thousands of biomedical equipment.

The National Department of Health, upon seeing the lack of professional biomedical engineering capacity, established the Biomedical Engineering School at the PNG University of Technology in 2020 in collaboration with the University and the Department of Higher Education Research Science and Technology. After 4 years of bachelor of Biomedical Engineering training from 2020 to 2023, the first 6 pioneer Biomedical Engineering students graduated on the 5th of April, 2024. Amongst the 6 graduates is a female.

A total of 19 provincial hospitals and the PMGH has well established Biomedical Engineering Workshops and 3 new provinces are yet to establish their workshops. Biomedical Engineering Services is provided using both in-house biomedical capacity as well as through outsourcing.

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The Government of PNG provides annual budgetary funding support for biomedical equipment replacement and maintenance. However, the amount of money allocated remains inadequate to provide an optimum level of biomedical engineering service.

The demand for specialist and tertiary level health service delivery demands a biomedical engineering workforce training and development program that will develop biomedical engineers and technicians with higher diplomas, degrees, masters and PhDs to meaningfully engage in teaching, research and management of the biomedical engineering service in PNG.

Effective collaboration and partnership between Government, Regulator, Academia, Industry and Research remains a challenge and a single most important objective for the growth of the biomedical engineering profession and service in the country.

The demand for basic and specialist health services due to the increase in population remain a major challenge to effective biomedical engineering service delivery. The need to develop a stronger and resilient biomedical engineering services at all the national and provincial hospitals to support the curative and public health programs to deliver health services to the people of PNG remain a major ongoing challenge.

We will continue to carry our challenges with us and address them as we journey towards achieving a stronger and resilient biomedical engineering services as mandated by legislation.

2. PROGRESS AND ACHIEVEMENTS

The Government of PNG through the Department of Health has designed and build a health system based on strong legislation to deliver health service from the national level right down to the rural areas. In the midst of challenges, PNG Biomedical Engineering Services have progressed but yet to reach perfection. Some of the notable progresses and achievements are articulated under the headings of policy, provision, products/medical equipment, people/patient care and personnel/workforce strategies. These achievements attributed to strong leadership and governance systems within the Department of Health.

2.1. Policy

- **Legislation**
 - National Health Administration Act, 1997, Public Hospital Act, 1994
 - Provincial Health Authority Act, 2007

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- **Policies and Standards**

- National Health Plan, 2021-2030
- National Health Services Standards, 2021-2030
- NDOH Corporate Plan, 2021 – 2025
- NDOH Training Policy under review
- Medical Equipment Policy, Private Public Partnership Policy
- International Standards Organization (ISO), Asset Management Policy

- **Regulations**

- Good Manufacturing Practice (GMP)
- Therapeutic Good Administration (TGA)
- Food and Drug Administration (FDA)
- Engineering Guidelines, WHO Guidelines on Medical Devices
- PNG Health Facilities Guidelines, International Health Facilities Guidelines
- Australasian Health Facilities Guidelines, Assistive Technology Guidelines & National Disability Policy

- **Governance**

- National Executive Council
- National Health Board
- NDOH SEM
- Finance & Planning committee, Standards committee, Project steering committees – PHA level
- Project Implementation Group
- Provincial Health Authority Board, Medical Board, Pharmacy Board
- Patient care committee – PHA level
- Biomedical equipment committee – PHA level

2.2. Provision

- National Coordination of Biomedical Engineering Standards at NDOH – Health Facilities Standards Branch (HFSB) level to guide implementation of biomedical engineering services at Provincial Health Authority Level
- Biomedical technicians or engineers per provincial hospital.
- Fully equipped biomedical engineering maintenance workshops.
- Specialist maintenance support from NDOH – HFSB.
- Maintenance of medical equipment at the provincial and district health facilities.
 - Facility and Medical Equipment Audit.
 - Medical Equipment Management System Database and Reporting.
 - Annual medical equipment replacement and maintenance budget.
 - Medical Equipment provision through international partnership support from Australia, New Zealand, Japan, China and South

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Korea, UNICEF, WHO, World Bank, Global Fund, USAID, European Union, UNOPS.

2.3 Products/Medical Equipment

- Medical Equipment Guidelines NHSS Volume 1 & 3, and health facilities level 1,2,3,4.
- International Standards and Guidelines for Medical Equipment. (ISO, WHO, FDA, TGA, CE) etc.
- Standard Medical Equipment list and specifications.
- Testing and Calibration equipment/instruments
- Spare parts/Backup
- Supply and maintenance contracts
- Operation and maintenance manuals
- Annual budget for medical equipment replacement and maintenance.

2.4 People/Patient Care

- Support the 14 clinical services at all levels of health care facilities – Level 1,2,3,4,5,6
- Support the 12 public health programs at all of health care facilities – Level 1,2,3,4,5,6
- Medical equipment care operation training for users.
- Equipment Electrical Safety testing for patient safety.
- Support Medical Board with private health facilities design and equipment standards and licensing.

2.5 Personnel/Workforce

- PNG University of Technology
 - 6 Pioneer Biomedical Engineers (1 female and 5 male) graduated on 5th of April, 2024.
 - All 6 Biomedical Engineers absorbed into Department of Health.
 - Undergo graduate training program.
 - Industrial training (6 – 12 weeks/Provincial Hospitals and Department of Health, Health Facilities Standards Branch, Biomedical Engineering Section.
 - 35 Biomedical Engineering Technicians/Engineers in PNG.
 - NDOH level – 5
 - PHA level – 17
 - PMGH - 1
 - Private health facility level - 12
 - Biomedical Engineering Workforce and training development plan.

3 CHALLENGES

The journey taken to develop a Biomedical Engineering Services in PNG since inception has not been easy. The continuous innovation and development of Biomedical Equipment and technology system will require continuous improvement in our system to accommodate the dynamic requirement of new medical equipment technology. The challenges are identified and managed as part of the system strengthening strategies of policies, provisions, products/medical equipment, people/patient care and personnel/workforce strategies as articulated below.

3.1 Policy

- Current Medical Equipment policy needs review.
- Review current Asset Management Policy
- No Biomedical Engineering Services strategic plan
- No procurement guidelines for Biomedical engineering equipment
- No biomedical engineering services and equipment guidelines
- No comprehensive PNG Health Facilities Guidelines
- Reporting and Governance system from National level to PHA level is not functioning effective
- NDOH training policy not specific to health engineering, health infrastructure and rehabilitation
- Lack of effective biomedical equipment governance committees

3.2 Provision

- 4 out of 22 provincial hospitals do not have a proper biomedical engineering workshops in place.
- Lack of qualified biomedical technicians and engineers.
- No centralized database for medical equipment.
- Inadequate annual budgetary support for medical equipment, replacement and maintenance.
- Lack of proper consultation to established partnership based on the Governments plans and priorities.

3.3 Products/Medical Equipment

- Lack of real time data of medical equipment availability and condition to make informed decisions.
- Inconsistency of annual budget appropriations for medical equipment replacement and maintenance.
- Lack of readily and available documentation for standard medical equipment list and functional and technical specifications manual for level 1,2,3 and 4 as the National Health Service Standards Requirement.
- Lack of standard medical equipment list with specifications for level 5 and 6 health facilities.

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- Lack of comprehensive country specific medical equipment guidelines.
- Lack of centralized in-country equipment testing and calibration facility.
- Lack of guidelines for medical equipment disposal.

3.4 People/Patient Care

- Lack of adequate medical equipment at all levels of health care.
- Lack of adequate medical equipment to support public health programs.
- Lack of adequately trained users to carryout care operations for medical equipment.
- Lack of effective medical equipment maintenance support.
- Lack of electrical safety testing of critical medical equipment

3.5 Personnel

- Lack of adequately qualified biomedical technicians and engineers at the 22 provincial hospitals and Port Moresby General Hospital
- No biomedical engineering technician training school in PNG.
- Lack of proper industrial training program and pathway for biomedical engineers/technicians
- Lack of a competency-based training development plan for biomedical engineering workforce.

4. FUTURE DIRECTIONS

The future direction of Biomedical Engineering Services in PNG is underpinned on the principle of continuous improvement and system strengthening in the strategic areas of policy, provision, products/medical equipment, people/patient care and personnel/workforce and most importantly partnership and collaboration between Government, Regulator, Academia, Industry and Research. At the regional level, similar approaches can be used to strengthen the biomedical engineering services network in the Pacific Region. Alternatively, a best practice system can be developed drawing from the challenges and lessons learnt by other Pacific Island countries. The PNG specific future directions are stated in the strategies identified to address the challenges in the areas of policy, provision, products/medical equipment, people/patient care and personnel/workforce as articulated below.

4.1 Policy

- Review medical equipment policy
- Review asset management policy
- Develop biomedical engineering services strategic plan

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- Develop procurement guidelines for biomedical equipment
- Develop biomedical engineering services and equipment guidelines
- Develop a comprehensive health facilities guideline
- Strengthening Reporting and Governance systems from National level to PHA level.
- Strengthen biomedical equipment governance committee systems.

4.2 Provision

- Establish 4 new biomedical engineering workshops and upgrade existing biomedical facilities to meet standards.
- Established a central calibration testing centre.
- Upskill the existing biomedical technicians and engineers and train new ones.
- Develop a centralized database for medical equipment.
- Advocate for consistent budgetary support for medical equipment and maintenance.
- Improve and strengthen donor coordination for the biomedical engineering services and equipment support.

4.3 Products/Medical Equipment

- Secure funding to provide optimum level of medical equipment at all levels of health care to support clinical and public health programs.
- Provide regular equipment care operation training to users.
- Carry out regular preventive maintenance and electrical safety testing of medical equipment.

4.4 People/Patient Care

- Secure funding to provide optimum level of medical equipment at all levels of health care to support clinical and public health programs.
- Provide regular equipment care operation training to users.
- Carry out regular preventive maintenance and electrical safety testing of medical equipment.

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4.5 Personnel/Workforce

- Create biomedical engineers/technicians' positions at NDOH, PMGH and PHAs.
- Develop a proper industrial training program for biomedical engineers/technicians.
- Develop graduate development programs for biomedical engineers.
- Develop a competency-based training development plan.
- Develop a national mentoring program for biomedical engineers and technicians.