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Improving Quality and Cost Diminution in Modern Healthcare Delivery: The Role of The Medical Laboratory Scientists in Nigeria.

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ABSTRACT: *Improving quality and cost diminution in modern healthcare delivery: the role of the medical laboratory scientist was adequately reviewed with interest in the situation of the Nigerian healthcare system. Effective Healthcare Delivery and Attaining Good Health for the Patients at-Best-Total-Costs and Value for Money cum improving the cost-benefit balance in healthcare is arguably today's most urgent public policy problem in Nigeria. However, the Medical Laboratory Scientist has a unique role to play in averting the present problem. Medical Laboratory investigations performed by Medical Laboratory Scientists plays a key role in preventive, diagnostic, therapeutic and referral services at all levels of the healthcare system. The Medical Laboratory Scientist has distinct functions such as provision of accurate laboratory results in a timely manner; providing adequate information to patients and monitoring responses to treatment; Monitoring the development and spread of infectious and dangerous pathogens; aid in the decision for effective control measures against major prevalent disease; Deciding medical diagnostic priorities and allocating resources; advise on the correct medical laboratory tests to be carried out per time and ensures proper collection methods of the various specimens required; performing equipment validation in the laboratories; ensuring critical diseases surveillance; plays a critical role in clinical and public health decisionmaking; confirming prognosis; contributing to Quality Assurance of a the health systems, and carries out possible laboratory researches for possible cost improvement. The bone of contention is the productivity and quality management of Medical Laboratory Services in order to actualize her unique role in the healthcare system. Nevertheless, the challenges facing Medical Laboratory Scientists that may affect cost diminutions and effective healthcare delivery are quackery and misdiagnosis; Poor working environments; the lack of adequate tools and equipment; Poor power supply; Lack of political will ranging from policies and law makers to various ministries and agencies; Unemployment of Medical Laboratory staff in the health facilities; Lack of TEAM work among the health professionals; Inadequate training and education of Medical Laboratory professionals; Unfavourable management decisions towards Medical Laboratory Services; Poor attitude to change and improvement; Lack of medical laboratory organogram in the various health institutions; Lack of Departments of Medical Laboratory Services in Ministries of Health and Tertiary Health Institutions; Lack of implementation of National Medical Laboratory Policy; Incessant intimidation and discrimination of Medical Laboratory Scientists and other health professionals. It is essential to embark on solid operational research to identify the root causes of poor Medical Laboratory Service and to develop practical models for not only building, but also maintaining Medical Laboratory capacity and services in Nigeria. It is therefore, imperative to ensure continuous training and retraining on the aspects of productivity and quality management system which is believed will boost professionalism and cost diminution in effective healthcare in Nigeria.*

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I. INTRODUCTION

The Medical Laboratory is a laboratory that is equipped with various biomedical instrument, equipment, materials and reagents (chemicals) for performing different medical laboratory diagnostic or investigative activities by using biological specimens (whole blood, serum, plasma, urine, stool, sputum, exudates etc.) for the purpose of disease discovery, management, and healthy living assessments.[1, 2]Treatment without the medical laboratory testsleads to "medical guess work" and self-medication after some medical professional prescriptions. Cost of diagnosis could probably have contributed to the poor attitude

towardsvisitingmedical laboratories for proper diagnoses. In some cases, misdiagnosis and poor quality service from the medical laboratory personnel could also contribute to the lack of willingness as regarding visits to medical laboratories.Quality is very important in every aspect of professional life especially in medical laboratory services. Considering developing countries where the majority of the populacedwell in poverty Nigeria for example, it shall be germane for cost control measures to be employed to achieve quality and affordable healthcare services.By general consent, Effective Healthcare Delivery and Attaining Good Health for the Patient at-Best-Total-Costs and Value for Money and improving the cost-benefit balance in health care is today's most urgent public policy problem. Costs are rising for private payers and government (which now accounts for more than half of all health care spending), but health outcomes are not rising at the same rate.Without changes, health costs could stress the Federaland State governments to the point of near-insolvencyas the Baby Boom generation ages and as ever moreexpensive technology comes online. Health costsalso affect jobs because some employers respond torising costs by not hiring more workers, or at leastconstraining the take-home pay of those they retain.Patients, meanwhile, negotiate a fragmented,confusing, and sometimes seemingly uncaring system,a product of accumulated accident and unintendedconsequences rather than design.This paper shall explore all the Medical Laboratory aspects of productivity and Quality Management System in healthcare practice with special interest in the Nigerian context of Medical Laboratory Services towards achieving best service and reducing cost of healthcare in general.

1.1 Medical Laboratory Science

Medical Laboratory science refers the practice involving analysis of human or animal tissues, body fluids, excretions, production of biologicals, designs and fabrication of equipment for the purpose of Medical Laboratory Diagnosis, treatment and research. It encompasses; Medical Microbiology (bacteriology, parasitology, virology,mycology), Clinical Chemistry (Chemical Pathology), Haematology & Blood Transfusion Science, Histopathology, Forensic Science, Molecular Biology, Laboratory Management, or any other related subject as may be approved by the appropriate authorities.[2, 3]

Medical Laboratory testing is an integral part of quality health care which provides physicians, nurses, and other healthcare providers with objective information that aids in patient care.This specialty helps in identifying risk for developing disease,early disease detection, planning disease management strategies, selecting safe and effective treatments options, monitoring treatment response, pinpointing threats to patient safety and public health, protecting the blood supply and transplants recipients from harmful pathogens,adverse transfusion reaction and testing for drugs of abuse to support clinical care as well as ensure public safety.

1.2 Medical Laboratory Scientist

A Medical Laboratory Scientist in the Nigerian context is the one that passes the examination prescribed for the qualifying status in anyinstitution approved for the purpose, and completes thepractical training and internship programme prescribed; or holds the equivalent qualification granted outside Nigeria and for thetime being as approved by the Board of Medical Laboratory Science Council of Nigeria after confirming that he/she has sufficient practicalexperience as a Medical Laboratory Scientist that can carry out analysis on human or animal tissues, body fluids, excretions, production of biologicals, designs and fabrication of equipment for the purpose of Medical Laboratory Diagnosis, treatment and research especially in the fields outlined above.The Medical Laboratory Scientist is a member of medical team, specialist in determining presence, extent and or absence of diseases.

II. ROLE OF MEDICAL LABORATORY SCIENTISTS IN HEALTHCARE DELIVERY

Healthcare includes the diagnosis, treatment and prevention of diseases, illness, injury and other physical and mental impairments in humans. It is delivered by practitioners in medicine, dentistry, nursing, pharmacy, Medical Laboratory Science, allied health professionals and other care givers. It refers to the work done in providing primary care, secondary care and tertiary care as well as in public health.[1, 2]

Obeta,[4] and Akuyam[5]highlighted the roles of Medical Laboratory Scientists in healthcare to include:

1. To provide accurate laboratory results in a timely manner to person(s) that need(s) the services. It is estimated that 60-70% of all decisions regarding patients' diagnosis, and treatment, hospital admissions and discharge are based on Medical Laboratory results.
2. The Medical Laboratory Scientist gives a scientific foundation by providing accurate information to those with the responsibility for: Treating patients and monitoring their response to treatment; Monitoring the development and spread of infectious and dangerous pathogens (disease causing organisms); deciding effective control measures against major prevalent disease; Deciding health priorities and allocating resources.
3. The Medical Laboratory Scientist guidephysicians and nurses in choosing the correct laboratory tests and ensure the proper collection methods of the various specimens required.

4. The Medical Laboratory Scientist performs equipment validation in the laboratories
5. The Medical Laboratory Scientist play a role in critical diseases surveillance, example Ebola,Tuberculosis, HIV and Malaria surveillance and control programmes.
6. The Medical Laboratory Scientist testing plays critical role in clinical and public health decisions making in the 21st century.
7. Medical Laboratory Science is heart of modern health care delivery and that is what Scientists represent.
8. The Medical Laboratory Scientist confirms or rules out prognosis due to signs and symptoms
9. Quality Assurance from the Medical Laboratory Scientist contributes immensely to Quality Assurance of a health facility
10. The Medical Laboratory Scientist carries out possible laboratory research for possible cost improvement or reduction in patients' diagnostic aspect of healthcare proceedings based on technology used and type of diagnosis used in the medical Laboratory.

Professor B. Oshotimehin[6] in his foreword stated that ''Medical Laboratory investigation plays a vital role in preventive, diagnostic, therapeutic and referral services at all levels of healthcare system. These services are rendered by different groups of trained, skilled, efficient and committed Medical Laboratory professionals, each discharging his or her duty with absolute compliance with professional code of ethical conducts.''

III. OVERVIEW OF PRODUCTIVITY AND QUALITY IMPROVEMENT IN HEALTH ORGANIZATIONS

Quality Management Systems can be defined 'as a set of interacting activities,methods and procedures used to monitor, control andimprove the quality of care'[7]. Quality authorities like Joseph Juran (1950's); Edward Deming (1950's) and Philip Crosby (1980's) have put forth several approaches to improve institutional performance. These approaches are embodied in a set of quality management practices, known as Total Quality Management (TQM). The rationale for adoption is that TQM has the potential to encompass the quality perspectives of both external and internal stakeholders in an integrated manner and thereby enable a comprehensive approach to quality management that will assure quality as well as facilitate change and innovation.[8-10]The implementation of Quality Management Systems (QMSs) in hospitals or health organizations, warrants that hospital managers and purchasers would benefit from a measure to assess the implementation of QMS.[11, 12]

The principles of quality improvement according to International Finance Corporation (IFC)[13]are based on the following:

a. Client-focus: Client-focused care is directed toward meeting the needs of patients and their families while considering dignity and respect, information sharing, participation and Continuity

b. Teamwork: Quality improvement activities are best carried out in multidisciplinary teams. Each member of the staff is valuable in the care and treatment of patients and each member has a role in providing quality care for the patient. Additionally,each team brings a different wealth of knowledge, experiences and skills, providing better understanding of an issue or process. Teams are capable of providing a greater number of ideas for solutions than individuals. And, when people work together, they are usually more committed to the solutions agreed upon. Therefore, involving all levels of staff in quality improvement initiatives creates a sense of accountability and ownership.

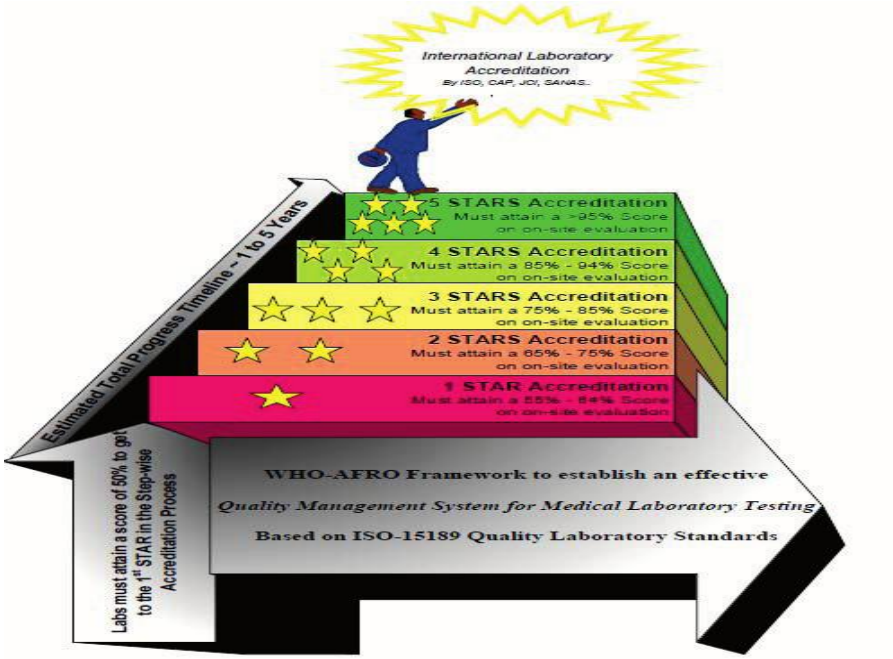
c. Leadership: Effective leadership is critical to the success of quality improvement efforts. Leaders provide the direction and support required to create a culture of quality. Leadership must incorporate "Quality" into the mission, vision and values of the organization. Leaders must be "present" and participate in quality improvement efforts, such as participating in quality-related training,Medical Laboratory assessment committees, making rounds, showing interest (by asking questions about activities and results), including Quality Improvement reports in meeting agenda, and giving recognition to individuals and groups.

d. Systems: Hospital/Medical Laboratory Services are provided within a system. The focus must be on improving the overall system and the processes within it to create an environment that meets the needs of the staff and patients alike. Quality standards assist the Medical Laboratory staff in looking at the various processes that affect the quality of care and diagnosis. For example, the process of maintaining an inventory has a direct effect on the availability of Medical Laboratory products, reagents and consumables. The focus is not on individual staff members rather on how well the system is working and finding ways to improve it.

e. Data: Sound decisions are made with the appropriate information. Therefore, quality improvement efforts rely on collecting data to assess performance, to identify strengths and gaps in performance, and to find solutions to improve performance and meet set standards. The measure of success is based on comparing the baseline measurement with the measurement after an improvement has been implemented.

Medical Laboratory quality systems are critical to the success of any Health/Medical Laboratory Services. The most important prerequisite for the establishment of an effective laboratory quality system is to create and/or adopt medical laboratory standards and regulations specific for each country's unique setting.

Currently, Nigeria (through the effort of MLSCN) is following international laboratory standards such as the InternationalOrganization for Standardization (ISO 15189), Good Medical Laboratory Practices (GMLP), and Clinical and Laboratory Standards Institute (CLSI), although the degree to which government laboratories adhere to these guidelines is not yet assessed. As a baseline, a quantitative audit assessment of the quality of laboratory systems should be performed to evaluate the organizational quality management of the laboratory, including assessments of personnel training and competency, laboratory equipment needs and preventive maintenance plan, supply chain and supply availability, quality systems and policies for specimen management, and test accuracy and precision. Improving laboratory quality systems requires financial commitment and support from the country's leadership and a time commitment from laboratory professionals in all health care settings. It is also critical to have political resolve and conviction that quality laboratory services are indispensable to ensuring delivery of good quality health care. Research and internationally funded laboratory activities should not be solely responsible for funding the running costs of quality systems as this would not be sustainable with the systemspotentially ending when the research or funding stops.[14, 15]The WHO-Africa Regional Office(WHO-AFRO) schema uses a 0- to 5-star scale for the recognition of evolving fulfillment of the ISO 15189 standard termed The WHO-AFRO Accreditation stepwise approach model.[16]This stepwise approach is intended to help identifyweakness, show laboratories where they stand, guide themwith a series of evaluations to help them demonstrate improvement, and recognize and reward their quality advancement.[17]The stepwise style has begun in Nigeria but the nerve-racking aspect is that all the medical laboratories undergoing such accreditation are nongovernmental or internationally funded laboratories of which the government health organizations need to column into such for improving the health services.



The WHO-AFRO Accreditation stepwise approach model(Adapted from Ali *et al.*, 2011)

IV. PRODUCTIVITY AND QUALITY IMPROVEMENT SYSTEMS AND CONTINUOUS IMPROVEMENT

Improving health workers' performance and productivity especially the medical laboratory professionals is vital to improving health care delivery.The Millennium Development Goals, and commitments, policies, and actions beyond 2015. However, policy makers, regulatory ministries and program planers still struggle to determine the correct set of actions to improve worker performance and productivity with respect to diagnostic professionals like Medical Laboratory Scientists.Medical Laboratory Scientist performance fences such as unclear roles and expectations, unclear guidelines, poor processes of work, inappropriate skills mixed within the work setting, competency gaps, lack of feedback, difficult work environments and unsuitable incentives means that even where there are no critical workforce shortages, Medical Laboratory Scientist may still fail to provide quality care. While substantive evidence of the effectiveness of different types of interventions to improve professional performance and productivity is still limited, salient features are emerging from existing studies and country experiences that can help inform a strategy for optimizing the performance and productivity of Medical Laboratory Scientist and the team of health worker.[18-20]

The science of improvement aims at making systematic changes in the way healthcare is provided toincrease the likelihood that those changes will result in improved care. Despite an abundance of evidence based guidelines and consensus on what should be done, many simple, high-impact interventionscapable of saving lives and alleviating suffering and reducing cost of health services are not reaching the people who need them mostespecially in Nigeria. Muchof this implementation gap is related to poorly designed processes of care delivery and weak healthsystems. To achieve Universal Health Coverage so that all sectors of the populace have access to quality medical laboratory care involves, improving theperformance of the medical laboratory workforce at every level–sub-national management levels, localfacilities, and communities with adequate Medical Laboratory Scientist involvement in National Health Insurance Scheme, National Agency for the Primary Health Care and other healthcare institutions. To do so, we need to strengthen the capacity of Medical Laboratory Scientists, Health and Laboratory Managers, frontlineproviders, community health workers, and volunteers to manage their own performance, identifystrategies for improving care, and monitor and evaluate best practices and health outcome results, sothat evidence produced from the medical laboratory will inform decisions and shape policies. This capacity, developed at all delivery levelsresults in strengthened systems and sustained quality Medical Laboratory Services and health care.[21]

Much of the current attention of quality improvement has been on redesigning care delivery processes toenable providers to follow evidence-based procedures. These experiences in adapting improvementmethods to work across organizations levels are showing auspicious results.[22] Employee involvementthrough quality improvement teams has resulted in improved processes of care and patient outcomes.[23]

Bringing teams of health workers from across the levels of the health system to work together inimprovement teams allows the system to tap into their knowledge of the system's inner workings anddevelop potential solutions that can work. Engaging Medical Laboratory Scientists in the design, testing andimplementation of changes enables clinical and non-clinical health workers at all levels of the system toinnovate and test practical ways that better utilize existing resources to improve Medical Laboratory Science aspect of health care.[23,24]

Educating health workers may only further magnify the "know-how" gap if health workers do not seethemselves as agents of change and are not empowered to make changes.[20] Increased engagementamong Nurses, for example, in high income countries has been associated with greater patientsatisfaction, nurse retention, and morale; lowered complications; and improved clinical measures suchas reduced infections and medication errors,[25] and such when extended to Medical Laboratory Scientists shall likely produce equal if not better results.Such extension to Medical Laboratory Scientists is very important now in Nigerian Primary Healthcare so as to include Medical Laboratory Scientists Scheme just like Nurses and Midwife Scheme.

Research in this area is just beginning and there is need to understand better what motivatesproviders to participate in improvement activities and build these factors into their improvedwork.[22] This is true in a recent research carried out by Obeta and colleagues[26] on Job Satisfaction Indices among Health Professionals in Jos University Teaching Hospital, as there is immense need for improving health professionals'in-service training effectiveness, advancement in academics and inclusion in the management team to cause efficiency and sustainability.

All health systems have some aspect of dysfunction, inefficiency, and ineffectiveness and continuousimprovement is a necessary part of day to day work for all medical laboratory workers. While health workerseducation and training systems have been doing increasingly better to build specific competencies topractice in their profession, most health professions' education and training systems are not equippinghealth workers with the competencies to brainstorm, test, study, implement, and spread changes. This challenge has been "nipped in the bud" by the Continuous Professional Development (CPD) programmes packaged by Medical Laboratory Science Council of Nigeria and the Association of Medical Laboratory Scientists of Nigeria as a criteria for renewal of annual practicing licenses. Consequently, improvement initiatives depend on ad hoc in-service training, while staff turnover androtations dilute the capacity of improvement teams in various health organizations.[22]

A key precondition to the sustainability of past and present investments in health care improvement isthe availability of a current and future workforce across the health system that has the competence tolead and participate in improving care especially the Medical Laboratory Scientist (MLS). There is currently a dearthof literature and opportunities for shared learning to integrate improvement competencies into the healthworker's education and training. Going forward, a platform is needed to bring together key stakeholdersto share learning, curricular, evaluations, and adult learning methodologies. This could enhance effective health team spirit in Nigerian health systems.

V. INTEGRATION OF MEDICAL LABORATORY INVESTIGATIONS AS A QUALITY IMPROVEMENT PROCESS IN THE PORTFOLIO OF CLINICAL AUDIT IN HEALTH DELIVERY

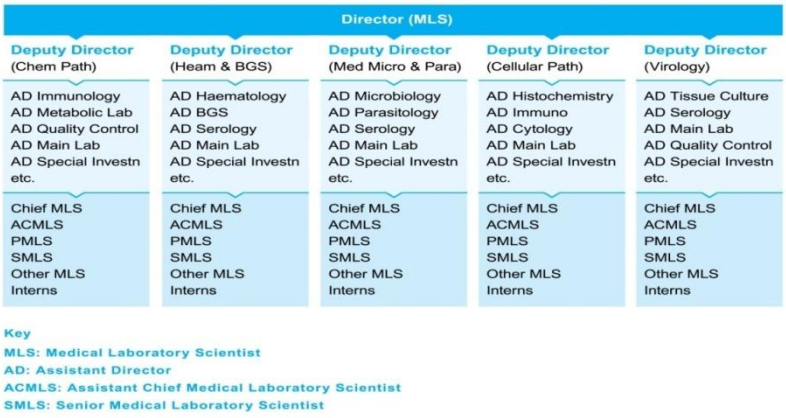
In developed countries like USA, the majority of medical decisions are made on the basis of quality laboratory testing according to established standards and enforced regulations. With the large investments of global health initiatives into resource-limited settings in sub-Saharan Africa like Nigeria,and Uganda, there is an opportunity to establish quality laboratory testing by overcoming barriers such as physical infrastructure, quality management plans according to external standards, and human resource capacity building. Strengthening laboratories could change the paradigm from empirical algorithm based clinical care to care based on accessible test-based accurate diagnoses.[17]

A close study of the income from health industries in Nigeria could reveal that 75% of incomes generated in patients care comes from the medical laboratories. The medical laboratory investigations has been integrated in clinical practice, however, the medical laboratory policies are out of place to drive the services and the available ones are not implemented. For instance is the Nigerian medical Laboratory Policy of 2007[14]which has been published was frustrated out of implementation.Not only that, the quality Improvements of the Nigerian Medical Laboratories are lacking because of corruption, mismanagement of Nigerian health systems and poor political will. An instance of this is the clamp down on other medical professionals from commencing and running residency programmes in Medical Laboratory Science by Nigerian Doctors and lack of passage into Law of the National Postgraduate College of Medical Laboratory Science (NPGCMLS)Act, 2014 and resubmitted as NPGCMLS Act, 2018 as opposed by Nigerian Doctors.

Nigeria loses $800m to medical tourism yearly as asserted by Nigerian Medical Association (NMA) as read in Vanguard News Paper of Friday May 1st, 2015. Nigerian spends $1bn annually on medical tourism as stated by The Chief Executive Officer of Nigeria Sovereign Investment Authority, Uche Orji who said that about 30,000 Nigerians spent $1 billion annually on medical tourism as reported by Vanguard of May 12, 2014. A thorough examination of the reasons behind medical tourism may reveal that there is inadequate medical laboratory diagnosis to detect killer diseases in Nigeria and this is mostly caused by poor medical laboratory facilities of our tertiary hospitals even when the personnel are available. Despite mass turn out of Medical Laboratory Science Graduates; there is unnecessary lack of Medical Laboratory personnel to the extent that Medical Laboratory Scientists 1, Senior Medical Laboratory Scientists and Principal Medical Laboratory Scientists Cadres are not available in most of the hospitals due to apathy on the part of top management staff of Nigerian tertiary health institutions towards employment of Medical Laboratory Scientists.

To worsen the situation, is the presence of Medical Laboratory Services Scheme in the Scheme of Service in Nigeria but such is not implemented in Nigerian tertiary health institutions from Federal Ministry of Health to many State Ministries of Healthand Tertiary Health Institutions. The National Industrial Court has looked into the matter of technical exclusion of Medical Laboratory Scientists in healthcare delivery in Nigeria and judged that Medical Laboratory Science is a distinct profession and should be accorded a separate Department and legally recognised department and are entitled to relate with other departments in their professional duties towards efficient healthcare delivery in Nigeria in all health systems in Nigeria ranging from Federal Ministry of Health.[28,29]However, this Court orders are yet to be implemented.

There is an urgent need to adopt an MLS Directorate for adequate inclusion of Medical Laboratory Services in healthcare system in Nigeria as suggested by Avioworo[30]Directorate Organogram as shown below:



VI. GOOD QUALITY MEDICAL LABORATORY INVESTIGATIONS IN ACHIEVING EFFECTIVE HEALTHCARE DELIVERY AND ATTAINING GOOD HEALTH OF THE PATIENT AT-BEST-TOTAL-COSTS AND VALUE FOR MONEY

Quality improvement is linked to performance improvement because improving quality tends to reduce costs. For example, when clinicians are uncertain about the best course of action to take, they tend to do more (example, more tests, more procedures and more observation). Therefore, health care organizations that undertake more analysis and promote evidence based medicine are more likely to reduce waste. In fact, some health professionals state that "the opposite of quality is waste" and waste reduction requires removing process flaws and non-value adding processes.The quality medical laboratory investigation for good health and affordable to every kind of patient in line with ACP,[31]PCORI[32] and McClellan & Rivlin[33]shall adopt the following rules:

Harnessing information: Systematicgathering and sharing data can unlock knowledge that produces systematic better choices in laboratory diagnosis. The key here is to incentivize a new corps of data entrepreneurs to collect and analyze existing medical laboratory data to discover and then disseminate the use of new and affordable technologies as short cut to uncountable diagnosis in attempt to discover the impending diseases and health challenges.

Improving research: Encourage more collaboration across institutions and funding more translational research (aimed at "translating" basic scientific discoveries into Medicines and Medical Laboratory Science). Such collaboration can also go across borders in other to ensure adequate and quality diagnosis at affordable rates.

Legal and regulatory reform: Modernizing medical laboratory malpractice systems, removing counter-productive restrictions on health insurance premiums, and streamlining new lines of tests. This shall include Policy formulations and implementations towards quality medical laboratory practice

Empowering patients: There are large benefits of giving more power to the people who matter most "patients" to make informed decisions about their own care especially in the type of diagnosis and cost implications.This will lead to an improved study and effective qualitative procedures in carrying out all medical laboratory diagnosis. Qualitative diagnosis minimizes trials and errors and as well reduces number of tests and costs of testing. This shall in turn cause a reduced cost on the part of patients and clients.

VII. METHODOLOGY AND ETHICAL ISSUES INVOLVED IN QUALITY ASSURANCE OF INCOMING LABORATORY MATERIALS AND FACILITIES, AND THE LEGAL AND MANAGERIAL RESPONSIBILITY OF A LABORATORY SCIENTIST

Ethical and responsible conduct is not only important for public relations, but it is also a necessary element in risk management. The reputation of a health care organization is critical in influencing patients seeking services. And, for those organizations aspiring to attract medical tourism, a good reputation is imperative. Hospitals/Medical Laboratory with good reputations also benefit from lower recruitment and orientation costs, as staff retention is high and the most qualified professionals tend to seek jobs with them.

The consequences of poor standards can be disastrous. Stories of unethical business practices are increasingly common in the news / media and have resulted in the demise of individuals and whole health care organizations. No hospital/laboratory executiveswant to find their institution or one of their staff in the news because of a patient being caused serious injury or death.

The involvement of Medical Laboratory Scientist is therefore imperative as the absence of quality assurance in the medical laboratory shall compromise the clinical decisions. The quality starts from the medical laboratory products of which 97% used in Nigeria is foreign and the logistics management of the products. This is the main reason why the MLSCN is collaborating with NAFDAC, SON and CBN for release of Medical Laboratory products handling to the Council as empowered by the MLSCN, Act 11 of 2003. However, this effort is frustrated by Nigerian Medical Association(NMA) who are not Medical Laboratory Scientists and lacks technical skills of handling laboratory materials. The NMA has included the withdrawal of such approval letter by CBN to MLSCN as part of their reasons for strike[34] and this is not very good for quality management and price check of Medical Laboratory Services in Nigeria.

An important basic ethical approach from Medical Laboratory Scientists is the draft and implementation of Material Transfer Assessment for any medical laboratory material from any other country, improvement on quality check and adequate logistics management with special attention to in cold chain management of medical laboratory products.

VIII. EMPLOYMENT OF QUANTITATIVE TECHNIQUES AND DATA SHOWING ECONOMIC AND FINANCIAL GAINS AS WELL AS SAFETY AND RISK MANAGEMENT MEASURES ASSOCIATED MEDICAL LABORATORY FUNCTIONS

Risk is unavoidable and present in every human situation. It is present in daily living, public and private sector organizations and most especially in healthcare where Medical Laboratory Services takes place has the highest risk exposure.[35] The financial gains of Medical Laboratory Scientists are enormous to the extent that it is not less in value of an averagegraduate.However, they are paid less among the health team. The entry point of a Medical Laboratory Scientist has been lower than other health professionals of whom the Nigerian Head of Service has issued a letter to upgrade the entry point of Medical Laboratory Scientists which is still facing partial implementation and upgrade. There is also Hazard allowance in the salary package but the challenge is that some health professionals who have less exposure to hazard are paid more than the Medical Laboratory Scientists who are highly exposed to numerous health risks.

Medical Laboratory Safety is part a Medical Laboratory Scientist training to avoid risk but the management of health organizations running medical laboratories has a lot of responsibilities to ensure adequate risk management.

IX. CHALLENGES OF MEDICAL LABORATORY SCIENTISTS IN THE COST REDUCTION IN HEALTHCARE DELIVERY

i. Without reliable Medical Laboratory Services, the source of a disease may not be identified correctly; Patients are less likely to receive the best possible care; Resistance to essential drugs may develop and continue to spread; Epidemic diseases may not be identified on time and with confidence. This is because Medical Laboratory Services in Nigeria have been reduced to only medical laboratory space in health system without adequate manpower and equipment. This has precipitated random quackery and exploitation for the sake of money without due consideration to quality and affordability.
ii. Misdiagnosis has become the order of the day as many working in various medical laboratories are not qualified to "man" such positions as diagnostic professionals. This has grown to its obnoxious apogee that all sicknesses and diseases have been ascribed to malaria and typhoid even when the patient is dying of cancer.
iii. Poor working environment has also been adopted mostly by private practitioners to the extent that toilet and kitchen spaces are now tagged Medical Laboratory without interest in the medical laboratory design and quality services.
iv. Poor working tools and equipment has grown to the point that some "diagnosticians" assume that only the microscope can do the magic. There have been decay and dilapidation of equipment without replacement and upgrade to latest or improved technologies.
v. Poor power supply has indeed destroyed many laboratory products that need cold chain and some equipment are left for generators to destroy with high voltages. High cost of fuel is another serious problem.
vi. Lack of political will ranging from policies and law makers to various ministries and agencies.
vii. Lack of medical laboratory staff or unemployment of medical laboratory staff in health facilities
viii. Lack of team work among health professionals which contributes immensely to incessant strikes among health professionals in government health establishments.
ix. Inadequate training and education of medical laboratory professionals ranging from discord curriculum in various universities to hindrances for establishment of National Postgraduate College of Medical Laboratory Science.
x. Ill-favoured management decisions towards Medical Laboratory Services. This is due to the absence or little involvement of Medical Laboratory Scientists among the management team because of absence of Directorate of Medical Laboratory Services.
xi. Poor attitudes to change and improvement among laboratory and management staff.
xii. Lack of laboratory organogram in health institutions causing haphazard approach to operations and services
xiii. Lack of Department of Medical Laboratory Services in Ministries of Health and Tertiary Health Institutions
xiv. Lack of implementation of National Medical Laboratory Policy from Federal Ministry of Health to Local Government Councils
xv. Incessant intimidation and discrimination of Medical Laboratory Scientists among other health professionals

X. CONCLUSION

In America, the Centres for Medicare and Medicaid Services (CMS) have designed a delivery model for Medicare patients known as Accountable Care Organizations (ACOs) that focuses on achieving the "triple aim" of high-quality patient care, improved population health, and reduced healthcare costs.[31]

Excellent medical laboratories are vital in ensuring accurate diagnoses and to identify pathology at early disease stages. It is essential to embark on solid operational research to identify other root causes of poor laboratory service and to develop practical models for not only building, but also maintaining medical laboratory capacity and services in developing countries like Nigeria. Government officials and health care professionals in the country should agree on the importance of creating strong medical diagnostic proficiencies. This approach is germane and important in Nigerian health system so that the role of Medical Laboratory Scientist in healthcare delivery would be well appreciated as the need for quality medical laboratories is often not considered a priority in improving a struggling health care system.

An effective and quality Medical Laboratory Service ensures adequate patient diagnoses and care and reducescost of diagnoses and drug treatments; and provides adequate information about public healthinterventions and disease surveillance.

This paper provides the following Suggestions:

A. For adequate inclusion of Medical Laboratory Scientist in health care delivery:

1. Promote the role of laboratory professionals to patients, other providers, healthcare administrators, educators, policy-makers, and the public at large, as an integral part of the medical service team in a transitioning healthcare system. Challenge current paradigms of laboratory service delivery to develop and implement novel approaches capable of guiding quality patient care in a more effective and efficient manner.
2. Conduct and disseminate original health services research that supports medical laboratory workforce policy and compel the nation toward an adequate supply of qualified laboratory professionals, with the appropriate skills and education, to ensure access to quality care for all citizens. Utilize high quality, objective, care-driven data to assess workforce supply and demand to provide projections for future needs to inform programs and policies that will meet the needs of an evolving healthcare system.
3. Engage in outreach opportunities that promote Science, Technology, Engineering, and Mathematics (STEM) education to support and promote the development of high-level skills critically important to the performance of quality medical laboratory testing and management, and to bolster the pipeline of potential candidates for the profession and leadership in health care.[36]
4. Develop and incorporate future-based products and information into educational programming *via* multiple platforms (web, conferences, and publications) that will enable Medical Laboratory Scientists to be at the forefront of health care.
5. Seek and support initiatives that promote the development of a qualified workforcethrough quality education programmes that reflect advancing technologies, maintaining high standards for certification of Medical Laboratory Scientists and laboratory accreditation programmes that incorporate personnel standards.
6. Promote a legislative and regulatory agenda that strives to increase interest and access to training leading to careers in Medical Laboratory Science. Harmonize State and Federal personnel and testing standards to remove unnecessary barriers to intra-state employment of well qualified Medical Laboratory Scientists.
7. It is essential to identify workforce policies and priorities that ensure an effective, properly trained workforce that leverages efficient operating models and the latest technologies. Moreover, as these policies and priorities are identified, they need to be coupled with sustainable advances in educational curricula, continuing education, ongoing competency assessments, and credentialing requirements with interest in quality and affordable Medical Laboratory Services.
8. Mandate all Medical Laboratory Scientists in Hospital/Laboratory and education based sector to enroll all their quality assurance officers in continuous training and retraining on the aspect of productivity and quality management systems that will boost professionalism and cost diminutions in effective healthcare in Nigeria.

B. The key policy options most likely to achieve attaining good health of the patient at-best-total-costs and value for money are those that:

1. Reduce avoidable, ineffective, and duplicate use of services, including technology thatdoes not improve patient care and encourage clinically effective care based oncomparative effectiveness research and implementation of information technology especially in medical laboratory services.[37]
2. Analyze costs and benefits before new medical technology is adopted in Medical Laboratory Services.

3. Coverage decisions should reflect evidence of effectiveness in various medical laboratory decisions and result.[38]
4. Benefits of a medical laboratory procedure should be designed to encourage patient responsibility without deterringneeded care for patients and clients.
5. Shared decision-making should be encouraged among various health professionals handling the patient and other decision making advice from other health institutions that had handled such cases.[39]
6. Pay appropriately for Medical Laboratory Services, and encourage adoption of innovativemodels of health care delivery that reduce or create effective cost management.
7. Pilot test and adopt new medical laboratory service models to align incentives with desired outcomes.
8. Ensure accurate pricing of medical laboratory services.
9. Require an independent study to evaluate and address inappropriate regionalvariation in pricing and costs.
10. The Federal Government should use its policies and purchasing power to negotiate the price ofMedical Laboratory Services covered by public plans rather than emphasis on public private partnership.
11. Improve the accuracy of relative values for Medical Laboratory Services and ensure an appropriate Medical Laboratory Scientist workforce specialty mix in the laboratory services.[40]
12. Establish specific and measurable goals for desired medical laboratory workforce and strategically lift caps on Medicare funded postgraduate medical laboratory education positions.[41]
13. Increased funding for programmes that provide scholarships or loan forgiveness toMedical Laboratory Scientists who complete a service obligation in underserved areas or environment.
14. Reduce administrative costs in various laboratories and health facilities and revolve the fund for medical laboratory improvement.
15. National Health Insurance Scheme services and claims should be uniform across all payers and spread to incorporate Medical Laboratory Services such that an average person under the scheme can afford the services in both private Hospitals and Medical Laboratories.
16. Regulate the costs from medical laboratory malpractice to ensure no-fault systems by providing health courts; enacting caps on non-economic damages; and providingMedical Laboratory Scientist immunity from malpractice claims for "failure-to-inform" forappropriately administered treatments in conjunction with patient shareddecision-making.
17. Promote wellness, prevention, chronic care management, changes in unhealthybehaviors, and encourage patient responsibility for health and cost-consciousness.Increase funding for wellness and prevention programmes, health promotion,public health activities, and support of the public health infrastructure; End agricultural subsidies for products harmful to health, such as tobacco,increase taxes on tobacco products, and strengthen regulation of the marketingand labeling of tobacco products. Revenue from such measures should be usedto promote programmes to improve population health and Medical Laboratory Services.
18. Develope a definition of value, based upon the needs and preferences of patients,measurable outcomes, safety and Medical Laboratory Service, compared to the cost of care over time such that a large portion of unnecessary Medical Laboratory Services should not be requested.
19. Create competition around results through pricing and quality transparency.Transparency and standards of measurement are critical if stakeholders are tomake value-based choices. Medical Laboratory Scientists must begin to compete onthese elements rather than focusing on cost-shifting and bargaining power toincrease value to the patients.
20. Hold all sectors in health care accountable for reducingwaste and inefficienciesthat lead to increased cost of Medical Laboratory Services.The basic tenet that anyproposal for change in Medical Laboratory Servicesmust demonstrate is how it wouldreduce waste and inefficiencies, not simply shift cost to another sector or increase cost burden on patients.
21. Create a trusted mechanism to synthesize scientific and clinical informationin an impartial and rigorous way for both medical laboratory consumers and providers.
22. Develope a good medical laboratory working team that shall ensure customer satisfaction with lean cost
23. Encourage formation of medically integrated systems to deliver effectiveand appropriate Medical Laboratory Services.[42,43]

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