AFTER ACTION REVIEW AS A TOOL TO IMPROVE A TERTIARY HOSPITAL'S RESPONSE TO OUTBREAKS: EXPERIENCE FROM IRRUA SPECIALIST TEACHING HOSPITAL

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INTRODUCTION

After-action reviews serve as a leadership and knowledge-sharing tool, assembling the team most closely involved in an activity or project upon reaching a pivotal milestone. These sessions facilitate open and honest discussions about both successes and failures. The primary aim is to glean insights from the experience and apply them to improve subsequent phases of the project or related tasks. While after-action reviews and retrospects are conceptually connected, they differ in the level of detail and formality applied during their execution.

Lassa fever (LF) outbreaks in Nigeria occur yearly with growing incidence and increasing geographical spread. In high-burden states, the outbreak occurs all year round, with a seasonal surge in cases between December and April. The changing dynamics of the disease in recent years led the World Health Organization to designate it a priority disease for research and development of new therapeutics, diagnostics and vaccines.

Irrua Specialist Teaching Hospital (ISTH) was declared a centre of excellence for the management of LF in 2011 and since then, the hospital has been a referral centre for diagnostics, surveillance and treatment in the state and neighbouring states.

On the 5th of January 2023, the upsurge in cases from the preceding month led the State Ministry of Health to declare an outbreak with the activation of the State Lassa Fever Emergency Operations Centre (EOC). A robust state-wide response was activated using the One Health approach and the involvement of the Nigeria Centre for Disease Control (NCDC) and partners, notably the World Health Organisation (WHO).

ISTH has been at the centre of the LF outbreak response for several years, and in the 2023 outbreak supported the PHEOC in the areas of laboratory testing, case management, surveillance, data management and infection prevention and control (IPC). Early in the outbreak, the ISTH response team identified what is now referred to as the 9 "Ls" of mortality, viz

1. Low index of suspicion
2. Late collection of blood samples
3. Late diagnosis
4. Late referral
5. Late presentation
6. Late initiation of therapeutic measures
7. Late dialysis support
8. Late availability of blood products
9. Low financial/family support

The outbreak was declared over by the State PHEOC on the 10th of May 2023, nevertheless, the ISTH continued to receive and treat confirmed cases of Lassa fever.

Under the International Health Regulations (IHR) monitoring and evaluation framework, after action reviews (AAR) are encouraged to be conducted after any response to public health emergencies to learn from

the response and improve preparedness and response to future outbreaks/and other public health emergencies. It was on this premise that the Irrua Specialist Teaching Hospital conducted the Lassa fever AAR meeting to identify best practices and challenges encountered during the response, validate existing mechanisms and identify areas for improvement to achieve the hospital's goal of a one-digit case fatality from Lassa fever.

The goal of the AAR was to scrutinize the institution's response to the 2023 outbreak, identifying best practices and areas for improvement, and developing workable strategies to better prepare the institution for future outbreaks whilst identifying interventions to reduce mortality and morbidity from Lassa fever.

The specific objectives were:

i. Identify capacities in place before the response and their ability to respond to the outbreak.
ii. Document any challenges that arose during the outbreak and the lessons identified,
iii. Identify any best practices observed during the response, including the development of new capacities.
iv. Identify practical actions for improving existing capacities whilst capitalizing on best practices.
v. Improve preparedness, readiness and response plans for future LF and other emerging infectious disease outbreaks.

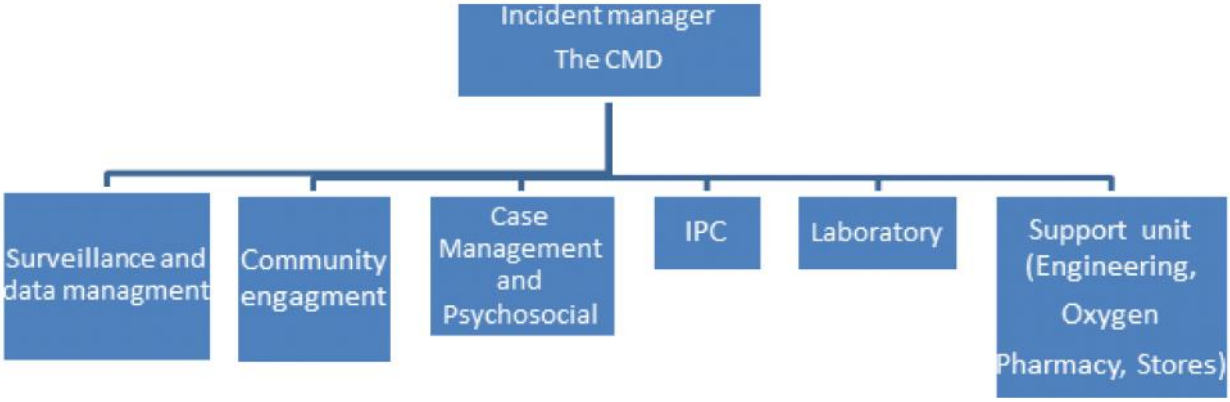
METHODOLOGY

The AAR commenced with the documentation of activities by the various teams involved in the outbreak, following a reporting template provided by the Institute of viral haemorraghic fevers and emergent pathogens control and research (IVEPCR). These teams gathered data relevant to their activities during the response such as utilization data for consumables and patient care medications and supplies, in patient admission records, supervisory notes, case report forms, and surveillance data and employing a qualitative and participative approach engaged in brainstorming, experience sharing and the use of trigger questions to come up with their pillar reports. Trigger questions included.

- What was in place before the outbreak?
- What happened in the response?
- What went well and why?
- What can we do to improve for future outbreaks?
- The way forward

When the time given for teamwork elapsed, teams submitted their reports which were collated into one AAR report for ISTH.

The AAR tested 7 out of the 13 core capacities for country preparedness towards epidemics. The incident management system for responding to the Lassa Fever outbreak was organized into 7 main pillars namely surveillance, data, and risk communication; laboratory; case management and psychosocial support, infection prevention and control, Pharmacy and Stores, Laundry and coordination, and AAR utilized the same pillar system to allow an exhaustive review of the strengths and gaps per pillar.



The review covers the period from the declaration of the start to the end of the outbreak.

Findings

The ISTH Lassa fever response was initiated on January 8, 2023, in response to an increase in the number of confirmed cases during Epidemiological Week 1, surpassing the threshold level of 10 as determined by the Surveillance and Data Unit and the Edo State PHEOC. The preceding week, from December 25th to 31st, had recorded six confirmed cases. The response was coordinated using an incident management system, with the Acting CMD Prof Reuben Eifediyi serving as the incident manager.

The ISTH EOC was held in the board room in the new administrative block, and the EOC pillars were constituted as shown below:

A. What was in place before the outbreak?

Before the outbreak, various components were already in place to address potential challenges. In terms of human resources, there were trained Lassa fever case management teams consisting of medical officers and specialist consultants. Additionally, staff had received training on infection prevention and control (IPC) from previous outbreaks. The team comprised over 40 scientific officers and lab scientists, alongside an active surveillance and data team responsible for notifying state and local government public health authorities of test results. An infection prevention and control (IPC) committee and team were also established. In terms of policies and guidelines, appropriate technical guidelines and standard operating procedures (SOPs) were available, including the ISTH Emergency Preparedness Plan and national guidelines for Lassa fever case management and infection prevention and control. Coordination efforts were supported by previous experience managing an ISTH Emergency Operations Center (EOC) and a financing mechanism for emergencies, ensuring timely funding for key activities. Points of entry into the hospital, such as the Accident and Emergency (A&E) department, Children's Emergency Room (CHER), Outpatient Department (OPD), and Gynecology Emergency, had been identified and designated accordingly. Regarding logistics, Ribavirin stocks provided by NCDC, laboratory test kits for PCR and support tests provided by BNITM, and point-of-care tests for rapid clinical care were readily available. Equipment and supplies included intensive care unit (ICU) support for critically ill patients, with the laboratory conveniently located near the isolation ward for efficient management.

C. Summary of Pillar Activities

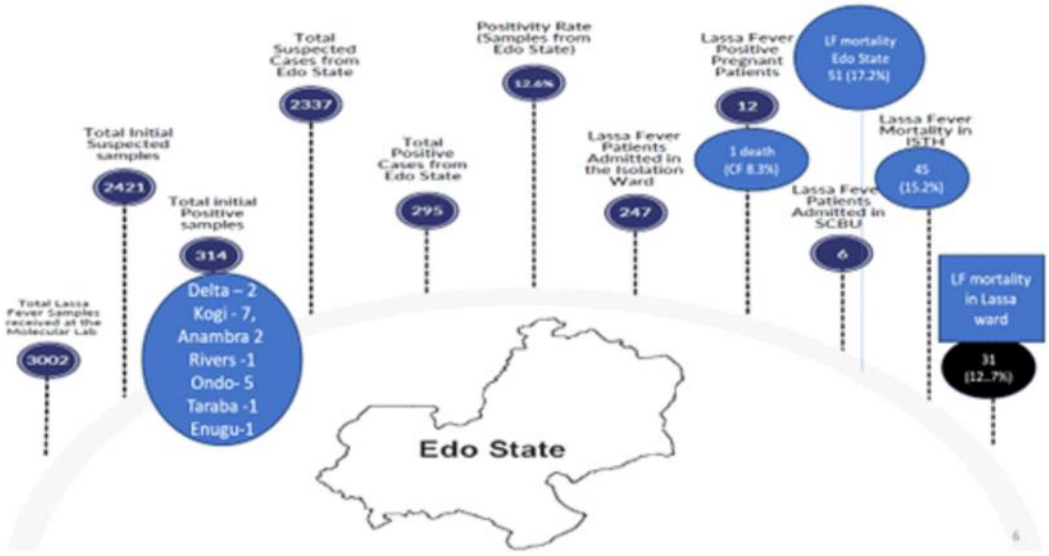
i. Coordination pillar

The coordination pillar was led by the Ag CMD with other members as the Director of Administration, Chairman Medical Advisory Committee (CMAC), Deputy CMAC and the Director of IVEPCR. The pillar's objectives included :

- Develop operational and contingency planning for outbreak response including information management within ISTH and outside, relating with partners, NCDC and WHO
- Coordination of stakeholders' activities in ISTH response
- Resource (Human, material, finance) allocation for the outbreak
- Coordinate information management between ISTH and partners.

The implementation of best practices had several positive impacts. Timely activation of the Emergency Operations Center (EOC), along with weekly meetings of the Intersectoral Technical Working Group on Health (ISTH EOC) and the production of meeting notes, ensured efficient communication and collaboration. Prompt responses to reported gaps and needs from various pillars facilitated swift adjustments and improvements. Collaboration with the Edo Health Information System (HIS) on treatment financing enhanced financial accessibility for patients. Effective coordination of activities with the Nigeria Centre for Disease Control (NCDC), state, and Federal Ministry of Health (FMOH) streamlined efforts and maximized resources. Timely approval and disbursement of funds

B. Summary statistics of the outbreak



for purchasing patient care equipment significantly reduced out-of-pocket spending for treatment by patients. Additionally, efficient coordination of partner responses was achieved through a combination of good existing relationships with the NCDC and partners, as well as strong political will demonstrated by the hospital's management.

ii. Case management and psychosocial support pillar

The case management pillar included the Lead medical officer in the isolation ward, consultants in Anaesthesiology, Psychiatry, Nephrology and haematology, Paediatrics and internal medicine. The pillar also included the matron in charge of the Lassa ward and the head of the counselling unit. The objectives of the pillar encompassed the reduction of the case fatality rate (CFR) to a single digit, coordination of a multispecialty team, provision of psychosocial support and discharge follow-up for patients and caregivers, planning and management of surge capacity during the outbreak including bed capacity, staffing, and medical supplies, as well as the operation of the isolation ward dialysis unit as an extension of the main hospital dialysis unit. Several best practices were identified, including achieving a good salvage rate for pregnant women, providing daily psychosocial support to patients and relatives, effectively triaging in-patients by moving stable patients to a separate ward, developing a suspect case algorithm for private practitioners, early initiation of dialysis, activation of the critical care team, organizing a blood donor drive for fresh frozen plasma, and conducting thrice-weekly mortality reviews. A total of 247 patients were admitted, including 71 children and 236 from Edo State, with 8 pregnant women treated. Notably, there was a reduction in CFR from 15% in 2022 to 13%. Additionally, 44 patients were admitted to the High Dependency Unit (HDU), 57 received oxygen therapy, 33 were on oxygen therapy for over 24 hours, and 2 were intubated in the HDU. Moreover, 122 survivors attended the follow-up clinic, and 145 patients' relatives received counselling. The successful implementation of these practices was attributed to technical expertise, availability of guidelines, and strong political will on the part of management.

iii. Surveillance, data management and risk communication

The pillar, led by the consultant overseeing the public health arm of IVEPCR, comprised data and surveillance officers, along with the head of the Department of Community Medicine. Its objectives were to heighten the index of suspicion among clinicians, ensure prompt communication of confirmed cases to LG DSNO for contact tracing and referral to ISTH, identify and track defaulters, coordinate with LGA teams for contact tracing activities, manage data effectively, disseminate data, and engage in risk communication within ISTH and the community regarding Lassa fever. Best practices included advocacy meetings with local governments and community stakeholders, collaboration with LGA teams on risk communication, involvement of CHEWs in contact tracing, generation and dissemination of reports for ISTH, state, and national levels, development of algorithms for suspect case referrals for private practitioners, and establishment of a WhatsApp group with DSNOs and partners for report transmission, along with daily situational reports. These efforts led to heightened suspicion indexes and improved suspect case management at private health facilities, real-time transmission of positive test results to DSNOs, contact listing and monitoring of caregivers and patient relatives in ISTH, and the training of 74 health workers in Edo Central and Edo North on Lassa fever case management. The success factors included good existing relationships with community headships and LGA teams, the availability of CHEWs in the Public health department, and dedicated data officers.

iv. Infection Prevention and Control

The IPC pillar comprised the IPC focal person and the IPC team. Its objectives were to enhance knowledge of IPC, prevent Lassa fever nosocomial infection among ISTH Staff, and support clinical and housekeeping staff in complying with IPC Standards. Best practices included IPC Training of Hygienists, daily supportive supervision of IPC in clinical wards, and the distribution of posters, hand hygiene commodities, and pedal bins. Additionally, 76 individuals, including nurses and hygienists, were trained. Furthermore, 25 Veronica buckets were repaired, 28 hand sanitizers were distributed, and 7 pedal bins were distributed. As a result, there were no healthcare worker infections. These achievements were facilitated by dedicated IPC staff and strong support from management.

v. Laboratory

The pillar, led by the consultant pathologist and comprised of the laboratory manager and their deputy, aimed to achieve several objectives. These included ensuring the prompt dissemination of positive results to all relevant stakeholders, maintaining quality assurance in laboratory processes, strictly adhering to biosafety and biosecurity measures, and achieving a 24-hour turnaround time for sample processing. The team implemented various best practices to achieve these goals. This included achieving a 24-hour average testing turnaround time, facilitated by harmonizing the data collection tool (CIF) to adequately capture patients' information and ensuring timely result dispatch and dissemination. Additionally, the team developed and distributed job aids on sample collection and handling to private health facilities. Throughout the period, a

total of 3002 samples were received, with 314 cases testing positive, resulting in a positivity rate of 12.6%. Notably, the timely delivery of results supported clinical decision-making processes. Furthermore, the implementation of the NCDC-Tranex sample courier system facilitated sample transportation to the ISTH. The availability of a large number of staff enabled efficient batch testing of samples, contributing to the successful execution of the pillar's objectives.

Challenges and Recommendations

The Coordination pillar reported challenges to include the irregularity availability of power and water at the IVEPCR. Additionally, inadequate funding posed constraints in meeting all needs during outbreak responses. Recommendations for the future included providing alternative power supply through solar inverters and durable UPS for IVEPCR, as well as advocating for the creation of a budget line specifically designated for outbreak response activities.

Surveillance, data management, risk communication, and community engagement faced obstacles primarily due to a lack of funds for sustained community-based awareness and engagement initiatives. Recommendations emphasized the necessity of budgetary allocations to support public health response activities in these domains.

In the area of Infection Prevention and Control (IPC), challenges included frequent shortages of clean bed linen in the wards and a poor culture of exposure and accident reporting. Proposed solutions encompassed supplying pedal waste bins to units lacking them, alongside initiatives for training and retraining waste handlers and IPC link nurses. Additionally, supportive supervision by the IPC team and the implementation of a performance reward system were suggested, along with strengthening linen movement tracking systems and enhancing training for relevant personnel. Case management faced manpower shortages, breakdowns in patient care equipment, and delayed presentations resulting in a high case fatality rate at the Institute of Virology. Future strategies involved early requests for surge staff, comprehensive training of nurses in equipment usage, and addressing staffing shortages.

Laboratory services encountered significant challenges, including grossly inadequate and defective space for Molecular Lab 1, prolonged equipment downtime due to biomedical engineer shortages, insufficient temperature-regulated freezers and fridges, and a lack of reagents for supportive investigations. Recommendations included extensive training and retraining of health workers on sample collection and transport, as well as the establishment of dedicated maintenance and repair officers for lab equipment. Plans were also made to expand and remodel the lab to conform with quality management systems.

Pharmacy and Stores operations struggled with documentation issues and occasional stock-outs of drugs, consumables, and supplies for Lassa fever case management. To address these challenges, proposals included establishing an efficient monitoring and reporting system for drugs and consumables, as well as advocating for a dedicated pharmacy within the isolation ward. The Laundry department encountered hurdles such as irregular supplies of clean linen due to delays in laundering caused by detergent stock-outs, and poor linen handling due to the lack of carts and trolleys. Proposed solutions centered around meticulous stock monitoring and quantification of detergent needs, alongside the procurement of dedicated carts for handling dirty and clean linen.

Lessons learned from the outbreak.

1. The incident command system with the CMD as the incident manager provides the political force required to manage the outbreak in ISTH
2. There is a need for a dedicated budget for response to outbreaks or emergencies.
3. Preparedness activities should commence before an outbreak. Simulation drills and training should be carried out periodically in readiness for any outbreak. A benchmark should also be set beyond which a request for surge staff will be made to NCDC.
4. Sensitization of health workers, particularly those in private practice should be sustained all year round.
5. Maintenance plans and end-user training on using all patient care equipment will reduce the frequency of breakdown of this equipment.
6. IPC systems and structures strengthening should be a continuous task for the IPC committee and team so that staff are prepared with adequate knowledge and good practice during outbreaks.
7. Greater engagement with the community will increase awareness and reduce late presentations.

CONCLUSION

Lassa fever (LF) outbreak has continued to occur yearly, with growing incidence and increasing geographical spread. The response to subsequent outbreaks must focus on limiting mortality and reducing the spread of disease. Attention to the recommendations of the AAR will improve ISTH mgt of the response. It should take a comprehensive, trans-disciplinary approach, from diagnosis, through case management, surveillance, community engagement, logistics support, risk communication with the multisectoral involvement of

all players at LGA, State and Federal levels of government.

REFERENCES

1. **Dalton CB,** Kirk MD, Durrheim DN. Using after-action reviews of outbreaks to enhance public health responses: lessons for COVID-19. Med J Aust. 2022. Jan 17;216(1):4–9.
2. **Nwafor CD,** Ilori E, Olayinka A, *et al.* The One Health approach to incident management of the 2019 Lassa fever outbreak response in Nigeria. One Health. 2021;13:100346.
3. Nigeria Centre for Disease Control. 2018 Lassa fever outbreak: after action review, 5–7 June 2018. Abuja; 2018 [cited 2024 March 23]. Available from: https://extranet.who.int/sph/sites/default/files/document-library/document/AAR%20Lassa%20Fever%20Nigeria%20%285-7%20June%202018%29.pdf.
4. **Sorbello S,** Bossi E, Zandalasini C, *et al.* After action reviews of COVID-19 response: case study of a large tertiary care hospital in Italy. 2021;36(5): 1758–1771.
5. **Sorbello S,** Pleet AR, Ambrosio A, Odone A. Using After-Action Reviews to Strengthen Hospital Preparedness: A Lesson Learned From COVID-19. Qual Manag Health Care. 2022 Jul-Sep 01;31(3):196-197.