Policy for U.S. Poliovirus Facilities to Manage Biorisks Based on Risk Assessment

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Contents

1. Purpose

The purpose of this document is to establish and communicate the policy of the U.S. National Authority for Containment (NAC) of Poliovirus (PV), Centers for Disease Control and Prevention (CDC), to assure U.S. poliovirus essential facilities (PEFs) develop and maintain robust biorisk management and risk assessment systems. These measures are crucial to ensuring the safety and security of eradicated PV materials, given the unique challenges posed by PV characteristics, such as the ability to infect vaccinated individuals, silent infection, and environmental stability. The document emphasizes the necessity for a reevaluation of risk assessments in the context of a post-eradication world, considering potential catastrophic consequences arising from gaps in immunization coverage and declining global population immunity. The standards outlined in the document align with the WHO Global Action Plan III (GAPIII), and U.S. PEFs are encouraged to adopt additional biorisk management control measures in accordance with their institutional policies. This policy aims to safeguard public health by ensuring effective measures are in place to manage the risks associated with eradicated PV materials.

Please note that this U.S. NAC Biorisk Management and Risk Assessment policy (NAC.AUDIT.POL.012.02) supersedes the previously published U.S. NAC Biorisk Management and Risk Assessment policy (NAC.AUDIT.POL.012.01).

2. Scope

The following statements apply to this policy:

- **Only U.S. facilities that possess or are in pursuit of a Certificate of Participation (CP) [i] issued by the U.S. NAC may be in possession of or receive wild PV/vaccine-derived PV (WPV/VDPV) type 1 infectious materials (IM).** U.S. facilities with oral polio vaccine (OPV) PV potentially infectious materials (PIM) should consider the WHO PIM Guidance document while facilities with WPV/VDPV PIM should review the U.S. NAC *Interim Guidance for U.S. Laboratory Facilities to Store and Work with Poliovirus Potentially Infectious Materials*.
- **U.S. facilities in possession of WPV/VDPV types 2 and 3 IM, as well as OPV type 2 IM must implement GAPIII and apply for an Interim Certificate of Containment (ICC).** [i]
- The U.S. NAC interprets WHO containment requirements and guidance from GAPIII, Public Health Management of Facility Related Exposure to Live Polioviruses, and other documents. With the assistance of an external working group and feedback from the affected PEFs, the U.S. NAC creates policies for implementing specific aspects of PV containment in the U.S.
- U.S. NAC policies are subject to modification depending on external circumstances such as the epidemiological situation, vaccination coverage, new international policies, or changes in eradication status.
- U.S. NAC policies excerpt information from GAPIII, shown in quotations, and/or include a reference to GAPIII elements or other materials where applicable.
- The terms: a) “shall” or “must” indicate a requirement; b) “should” or “consider” indicate a recommendation; c) “may” indicates a permission; d) “can” indicates a possibility or a capability.

3. Acronyms

Acronym	Definition
BMBL	Biosafety in Microbiological and Biomedical Laboratories, Sixth edition

CDC	Centers for Disease Control and Prevention
GAPIII	WHO Global Action Plan, Third edition
IM	Infectious materials
IPV	Inactivate polio vaccine
NAC	National Authority for Containment of Poliovirus
OPV/Sabin	Oral poliovirus vaccine
PEF	Poliovirus essential facility
PIM	Potentially infectious materials
PRP	Personnel reliability policy
PV	Polioviruses
VDPV	Vaccine-derived poliovirus
WHO	World Health Organization
WPV	Wild poliovirus

4. Definitions

Term	Definition
Biorisk	Risk relating to biosafety and biosecurity where the principal hazard is a biological agent (in this case, poliovirus). [ii]
Biorisk management system	The organizational structure, planning activities, responsibilities, practices, procedures, processes, and resources for developing, implementing, achieving, reviewing and maintaining an organization's biorisk policy. [ii]
Consequence (severity)	Outcome of an event affecting objectives. Notes: 1) an event can lead to a range of consequences, 2) a consequence can be certain or uncertain, 3) consequences can be expressed qualitatively or quantitatively. [iii]
Containment	A system for confining microorganisms, organisms, or other entities within a defined space.
Event	Occurrence or change of a particular set of circumstances. [iii]
Global Action Plan III	The WHO global action plan to minimize poliovirus facility-associated risk after type-specific eradication of wild polioviruses and sequential cessation of OPV use (GAPIII). The 3rd edition of the Global Action Plan (GAPIII) aligns the safe handling and containment of poliovirus infectious and potentially infectious materials with the WHO Endgame Strategy and replaces both the 2009 draft version of the 3rd edition and the 2nd edition of the WHO global action plan for laboratory containment of wild polioviruses.
Hazard	Any source, situation, or act with potential for causing harm. [ii]
Incident	Event(s) that occurs in or arising out of the course of work that could or does result in harm.
Infectious Dose	The number of microorganisms required to initiate an infection.

Infectious materials	WPV/VDPV • Clinical materials from confirmed wild poliovirus (including VDPV) infections. • Environmental sewage or water samples that have tested positive for the presence of wild polioviruses. • Cell culture isolates and reference strains of wild poliovirus. • Seed stocks and infectious materials from IPV production. • Infected animals or samples from such animals, including human poliovirus receptor transgenic mice. • Derivatives produced in the laboratory that have capsid sequences from wild polioviruses [1], unless demonstrably proven to be safer than Sabin strains. The safety of new derivatives containing wild poliovirus capsid sequences will be assessed by an expert panel [2], on the basis of comparison to reference Sabin strains for (i) degree and stability of attenuation; (ii) potential for person-to-person transmission; and (iii) neurovirulence in animal models. • Cells persistently infected with poliovirus strains whose capsid sequences are derived from wild poliovirus [3]. [ii] OPV/Sabin • "Cell culture isolates and reference OPV/Sabin strains. • Seed stocks and live virus materials from OPV production. • Environmental sewage or water samples that have tested positive for the presence of OPV/Sabin strains. • Fecal or respiratory secretion samples from recent OPV recipients. • Infected animals or samples from such animals, including poliovirus receptor transgenic mice. • Derivatives produced in the laboratory that have capsid sequences from OPV/Sabin strains [4]. Cells persistently infected with poliovirus strains whose capsid sequences are derived from OPV/Sabin strains [5]. [ii]
Likelihood	Chance of something happening. Note: in risk management terminology, "likelihood" is used to refer to the chance of something happening, whether defined, measured or determined objectively or subjectively, qualitatively, or quantitatively, and described using general terms or mathematically,[such as a probability or a frequency over a given time period. [iii]

[1] For U.S. facilities, PV derivatives must contain a complete full-length WPV capsid sequence to meet the WPV IM definition.
[2] Expert panel will be determined by WHO.
[3] For U.S. facilities, PV strains must contain a complete full-length WPV capsid sequence to meet the WPV IM definition.
[4] For U.S. facilities, PV derivatives must contain a complete full-length OPV/Sabin capsid sequence to meet the OPV/Sabin IM definition.
[5] For U.S. facilities, PV strains must contain a complete full-length OPV/Sabin capsid sequence to meet the OPV/Sabin IM definition.

Oral polio vaccine /Sabin	"Attenuated poliovirus strains (approved for use in oral polio vaccines by national regulatory authorities, principally Sabin strains)." [ii] Also called 'Sabin vaccine', OPV contains live, attenuated (weakened) poliovirus strains. OPV formulations include: • Trivalent OPV (tOPV) contains all three serotypes of Sabin strains (1 + 2 + 3); use of tOPV ended in April 2016 • Bivalent OPV (bOPV) contains Sabin strains 1 + 3; as of April 2016, only bOPV is used routinely • Monovalent OPV (mOPV) contains only one serotype of Sabin strain
Personal Protective Equipment	"Equipment and/or clothing worn by personnel to provide a barrier against biological agents, thereby minimizing the likelihood of exposure. PPE includes, but is not limited to, laboratory coats, gowns, full-body suits, gloves, protective footwear, safety glasses, safety goggles, masks, and respirators." [iv]
Poliovirus	A picornavirus consisting of three serotypes: 1, 2 and 3; protective immunity is type-specific. Poliovirus serotypes are further subdivided into wild (circulating in nature) and Sabin strains (attenuated strains used for oral polio vaccines). Poliovirus types 2 and 3 have been eliminated in the wild. In this current stage of polio eradication, only type 1 wild poliovirus continues to circulate in endemic areas. It is highly infectious and causes paralytic polio.
Poliovirus containment area	Poliovirus-essential facility area(s) listed on the PEF CP application. Infectious materials of OPV2 and WPV/VDPV of all three serotypes cannot leave containment area(s) without a transport container or have been inactivated using a validated method. Access to PV containment area(s) must be limited to essential personnel only.
Poliovirus- essential facility	"A facility designated by the ministry of health or another designated national body or authority as serving critical national or international functions that involve the handling and storage of needed poliovirus infectious materials or potentially infectious materials under conditions set out in this [GAPIII] standard." [ii] U.S. PEFs will possess or be in pursuit of a CP.
Potentially infectious materials	• "Fecal or respiratory secretion samples and their derivatives (*e.g.* stool suspensions, extracted nucleic acids, etc.) collected for any purpose in a geographic area where WPV/cVDPV is present or OPV is being used at the time of collection; • Products of such materials (above) from PV-permissive cells or experimentally infected polio-susceptible animals; • Uncharacterized enterovirus-like cell culture isolates derived from human specimens from countries known or suspected to have circulating WPV/VDPV or use of OPV at the time of collection; • Respiratory and enteric virus stocks derived from PV PIM and handled under conditions conducive to maintaining the viability or enabling the replication of incidental PV; and • Environmental samples (*i.e.,* concentrated sewage, wastewater) collected from areas known or suspected to have circulating WPV/VDPV or use of OPV at the time of collection." [v]

Poliovirus materials	Unless a serotype is specifically identified, PV materials refer to IM and PIM of all three PV serotypes. [ii]
Risk	A combination of the probability of the occurrence of harm and the severity of that harm.
Risk assessment	An objective process to identify hazards, to measure the risk or probability of something happening because of that hazard, and to consider the consequences of it happening. • Hazard identification: Process of finding, recognizing, and identifying all hazards relevant to risk. • Risk analysis: Process to comprehend the nature of risk and to determine the level of risk. [iii] • Level of risk: Magnitude of a risk, expressed in terms of the combination of consequences and their likelihood. [iii] • Risk evaluation: Process of comparing the results of risk analysis with risk criteria to determine whether the risk and/or its magnitude is acceptable or tolerable. [iii] • Residual risk: "Risk remaining after risk treatment" or risk control. Note: residual risk can contain unidentified risk. [iii]
Risk Management	The process of implementing steps to mitigate risk.
Risk Source	Element which alone or in combination has the intrinsic potential to give rise to risk. [iii]
Vaccine derived poliovirus	Classified with wild polioviruses and usually demonstrate 1–15% sequence differences from the parental OPV strain; they may have circulated in the community (cVDPV) or have replicated for prolonged periods in immunodeficient subjects (iVDPV) or be ambiguous and of unknown origin (aVDPV).

5. Content

World Health Organization GAPIII requires that PEFs establish and implement a comprehensive program to manage risks associated with PV, including a biorisk management system (GAPIII element 1) and risk assessments (GAPIII element 2). As stated in this policy, U.S. NAC adopts the WHO GAPIII standard and all guidance for these requirements.

Global Action Plan, 3rd edition (GAPIII) "consists of 16 elements and sub-elements based on the principles of a quality management system. It assumes that the organization is best placed to understand the risks associated with its work and can manage those risks in a number of ways acceptable to the national and international bodies responsible for facility oversight. This standard further assumes that PEF personnel and management at all levels fully appreciate the enormity of the consequences of accidental or malicious PV release in the post-eradication/post - OPV era and are prepared to demonstrate that the appropriate systems and controls are in place to manage those risks." [ii] However, a study conducted by Sandia National Laboratories found that WPV/VDPV and OPV type 2 IM (PV2) facilities in the United States use prior experience-based risk assessments where the perception of PV risks may be underestimated in a post-eradication world and consider different factors in risk management leading to a lack of standardization of facility-specific risk decisions. [vi] In particular, an international standard for

laboratory risk assessments has not been established, and this area is challenging for facilities to implement GAPIII.

Enhanced laboratory practices are especially important for PEFs retaining PV in the post-eradication era. Unlike many pathogens, PV poses a significant challenge for medical surveillance of infected individuals as most infections are asymptomatic. [vii] Biosafety and occupational health professionals must develop appropriate programs based on known or potential PV containment breaches, incidents, or accidents, in contrast to programs that monitor individuals for symptoms. Notably, vaccinated individuals are protected from development of PV disease, but not from infection or re-infection with the virus. As a result, an occupational exposure may result in an asymptomatic infection of an immunized laboratory worker and silent reintroduction of the virus into the environment. [viii] Thus, PEFs must implement strong risk management, communication, training, and incident reporting systems to safeguard PVs. Please see the U.S. NAC Occupational Health and Emergency Response policies for additional information.

Historically, the biosafety community has relied on predefined biosafety levels and agent risk groups in laboratory risk assessments to determine risk and prescribe mitigation strategies. In contrast, a biorisk management system is tailored to the laboratory work plan and emphasizes the type of work conducted, who performs the work, and work locations to develop and implement appropriate risk management strategies. [ix] WHO GAPIII has established a biorisk management framework with the goal of risk reduction as close to zero as possible and specifies PEFs must implement new, robust PV risk assessment and mitigation strategies.

5.1 Biorisk Management System

Commitment and leadership from senior management lay the foundation of a solid biorisk management system (GAPIII element 1). The biorisk management system has similarities to a quality management system (QMS), and PEFs may be able to leverage the attributes from such a system for PV materials. Further, the biorisk management system in GAPIII is based upon the European Committee for Standardization (CEN), CEN Workshop Agreement (CWA) 15793:2011 on laboratory biorisk management [x], now published as International Standards Organization (ISO) 35001: Biorisk management for laboratories and other related organizations [xi]. For additional information on biorisk management, refer to ISO 35001 and the WHO laboratory biosecurity manual [xii], currently pending revision. Poliovirus-essential facilities may also reference ISO 9001: Quality Management Systems in development of an appropriate system and process [xiii].

5.1.1 Biorisk Management Policy

Poliovirus essential facility top management, including staff with the authority to affect institutional policies, develops and implements a PV biorisk management policy *(GAPIII subelement 1.1*). To demonstrate its commitment to the biorisk management policy, "actions taken by top management include development, authorization, signing" the biorisk management policy. Further, "biorisk management should be stated clearly as part of the organization's health, safety, security and environment policies where appropriate." *(GAPIII subelement 1.1.1*) Top management reviews the biorisk management policy on annual basis or as necessary.

The PEF PV biorisk management policy must clearly state "the overall biorisk management objectives" and a "commitment to improving biorisk management performance." *(GAPIII subelement 1.1.2)* In addition, the policy is "appropriate to the nature and scale of the risk

associated with the facility and associated activities." *(GAPIII subelement 1.1.3)* Thus, the policy must apply to all projects with PV materials and all areas where these materials are handled or stored.

The PEF PV biorisk management policy "commits to:

1) protecting staff, contractors, visitors, the community and the environment from PV materials that are stored or handled within the facility;
2) reducing the risk of the unintentional release of, or exposure to, PV materials;
3) reducing the risk of the unauthorized intentional release of hazardous biological materials to an acceptable level;
4) complying with all legal requirements applicable to the PV materials that will be handled or possessed, and with the requirements of this standard;
5) ensuring that the need for effective biorisk management takes precedence over all non-"health and safety" operational requirements;
6) informing all employees and relevant third parties effectively and communicating individual obligations with regard to biorisk to these groups;
7) improving biorisk management performance continually." *(GAPIII subelement 1.1.4)*

Further, the PEF PV biorisk management policy requires that "all poliovirus projects/work areas be assessed for risks and a full assessment be prepared before approval is given to commence work" *(GAPIII subelement 1.1.2 guidance)*, risk assessments are conducted and the required control measures are implemented *(GAPIII subelement 1.1.3)*, and personnel conducting the work understand the hazards and how to adequately mitigate risk. Overall, the PEF policy should define the systems or processes used to ensure institutional approval, employee engagement, and ongoing monitoring and control of PV activities.

In addition to implementing a PV biorisk management policy, PEF top management ensures that roles, responsibilities, and authority are defined and communicated to the appropriate individuals. Roles, responsibilities and authorities from GAPIII must be designated at the appropriate level of seniority within the biorisk management system.

5.1.2 Roles, Responsibilities, and Authorities

"Effective management and organization are vital to the success of any activity, and management commitment and leadership lay the foundation upon which a solid biorisk management system is built. Management must have clear strategies and objectives from which roles and responsibilities are allocated, implemented, and monitored. Without effective management commitment and appropriate organizational structures, all other initiatives aimed at managing risk will be ineffective. The way management thinks and acts has a major impact on performance." *(GAPIII element 1)*

5.1.2.1 Top Management

Top management (*e.g.*, directors or executives for the institution) shall take "ultimate responsibility for the organization's biorisk management system" *(GAPIII subelement 1.3.1)*. Top management has ultimate responsibility to manage and accept risk for retention of PV at the institution. It is required that top management is notified of and approves risk assessments with a high residual risk level following implementation of identified controls. Top management may delegate approval of

moderate or low residual risk levels to the PV biorisk management committee that includes a senior management representative.

While top management has the responsibility for managing biorisk, decision making authority and "tasks may be delegated through the organization, provided they are passed to competent individuals with adequate resources to perform the activities safely and securely" *(GAPIII subelement 1.3.1 guidance)*. Individuals can demonstrate competency via training programs, applicable on-the-job experience, or other a combination thereof. For example, an institution may establish a tiered decision authority for management of biorisk, as long as designated individuals with decision making authority are authorized to legally bind the institution. Tiered levels may permit approval by the laboratory, division, or institutional representative. Further, it is important to "define roles and responsibilities, have clear communication within the organization regarding actions that need to be taken, and establish who has the required authority." *(GAPIII subelement 1.3.1 guidance)* As a result, institutions shall document top management and delegated staff, including chain of authority/command, for PV activities in an organizational chart. It is recommended that top management receive frequent briefs/updates regarding the biorisk management system for any delegated tasks as top management has ultimate responsibility for system performance.

"Top management ensures that roles, responsibilities and authority related to biorisk management are defined, documented and communicated to those who manage, perform and verify work associated with the control of polioviruses." *(GAPIII subelement 1.3.2)* This information may be recorded as part of the PV biorisk management policy or other supplemental standard operating procedure.

"Top management demonstrates its commitment by ensuring the availability of resources to establish, implement, maintain and improve the biorisk management system. Resources include human resources and specialized skills, organizational infrastructure, technology and financial resources." *(GAPIII subelement 1.3.3)*

Top management is responsible for ensuring the continual review and ongoing assessment of risk for the PEF. For example, essential personnel should be assessing potential risks daily in the containment area. Risk assessments should be subject to a continual review cycle including at least three time points including annual review or renewal, new procedures or incidents, and GAPIII Risk Assessment Action Items. Global Action Plan, 3rd edition (GAPIII) requires that risks are formally assessed prior to conducting a new procedure and following an incident (*e.g.*, during the root cause investigation) [see also GAPIII Risk Assessment Action Items below]. It is recommended that risks are assessed at the time of reviews or renewals of a standard operating procedure or protocol.
In addition, top management performs a review of "the organization's biorisk management system at planned intervals, at least annually, to ensure its continuing suitability, adequacy and effectiveness" *(GAPIII subelement 1.17.1).* The review includes "assessing opportunities for improvement" and "determining the need for changes to the system, procedures, policies and objectives" *(GAPIII subelement 1.17.2)*. Management reviews should include information on self-audit results,

compliance with standard operating procedures (SOPs) and work instructions, status regarding risk assessment activities, status of preventive and corrective actions, action items from previous management reviews, changes that could impact the system, recommendations for improvement, and results of accident/incident investigations *(GAPIII subelement 1.17.2 guidance)*.

"Records are maintained from the management review" *(GAPIII subelement 1.17.3)*, including date(s) and name of participants involved in the review. "Documented records are maintained in paper or electronic form for a minimum of 10 years from the day of withdrawal and should be available for review during national certification/WHO verification procedures" *(GAPIII subelement 1.4.2)*. These records include "decisions and actions related to improvement of the biorisk management system's effectiveness; improvement related to the requirements and risk assessments; resource needs." *(GAPIII subelement 1.17.3 guidance)*

5.1.3 Biorisk Management Committee

Poliovirus essential facilities establish a biorisk management committee to "act as an independent review group for biorisk issues associated with the poliovirus facility" *(GAPIII subelement 1.3.6)*. "The biorisk management committee is often recognized as the institutional biosafety committee. Its role may be either a dedicated function or one that is addressed through a committee with a wider remit." *(GAPIII subelement 1.3.6 guidance)*

The biorisk management committee: "1) has documented terms of reference; 2) includes a representative cross section of expertise, appropriate to the nature and scale of the activities undertaken; 3) ensures issues addressed are formally recorded, and actions are allocated, tracked and closed out effectively; 4) is chaired by a senior individual; 5) meets at a defined and appropriate frequency," at a minimum of annually, and when otherwise required *(GAPIII subelement 1.3.7)*. For example, the committee shall convene additional meeting(s) following discovery of an incident resulting in a containment breach, failure of essential facility equipment, or other significant emergency scenario.

The committee's functions include, but are not limited to: "contributing to the development of institutional biorisk policies and codes of practice; approving proposals for new work or significant modifications to the potential risk associated with existing activities; reviewing and approving protocols and risk assessments for work involving polioviruses; reviewing information related to significant accidents or incidents, data trends, associated local or organizational actions and communication needs." *(GAPIII subelement 1.3.7 guidance)*

The biorisk management committee reports to senior management. *(GAPIII subelement 1.3.7)*

5.1.3.1 Personnel Roles

Personnel must be designated for the PV biorisk management system (Appendix 1). All roles listed in Table 1 must be identified and documented for the biorisk management system. "In assigning roles and responsibilities, potential conflicts of interest should be considered" *(GAPIII subelement 1.3.2 guidance)*. Note, "in smaller

organizations, one individual may hold more than one role described in this standard" *(GAPIII subelement 1.3.1 guidance)*. Further, position description titles used by personnel at the facility may differ from the identified roles below.

All essential personnel with access to the PV containment area(s) and PV inventory are trained, agree to comply with the institutional biorisk management system, report incidents and near-misses (*e.g.,* incidents that do not result in infection or personal harm) (*GAPIII Element 11*) and adhere to good laboratory practices to minimize risk of a PV theft, loss or release. It is essential that personnel supporting PV containment recognize risks that warrant robust risk management. Further, personnel with access to PV containment areas must be informed of the risks posed by PV where incidents with the highest potential for facility-associated re-introduction of virus into the community are (asymptomatic) infection and shedding from an exposed worker, as well as release of PV beyond the laboratory containment boundary. Essential personnel are critical to the ongoing success of PV containment and eradication of poliomyelitis.

5.1.4 Objective, Targets, and Program

A biorisk management system is established, documented, implemented, maintained and improved *(GAPIII subelement 1.18.1)*. WHO states that "one of the goals of the biorisk management approach is to develop a comprehensive laboratory biosafety and biosecurity culture, allowing biosafety and biosecurity to become part of the daily routine of a laboratory, improving the overall level of working conditions, and pushing for expected good laboratory management". [ix] To accomplish these goals, institutions may need to provide additional resources to establish, document, and maintain comprehensive systems and processes for management of PV containment areas and associated supporting services. Ongoing monitoring and improvement of these processes are critical to identify any gaps in a proactive manner and to address issues prior to a system failure and potential containment breach. As a result, PEFs will need to remain vigilant for as long as PV materials are held by the institution and continually strive to improve processes and engage personnel to maintain commitment to a culture of responsibility and safety. It is strongly recommended that institutions foster a non-punitive culture of reporting any incidents, accidents, or close calls (also known as near misses) related to PV containment.

Biorisk management systems are multi-faceted and should be tailored to the scope and complexity of the PV activities. Appendix 2 describes fundamental components of a biorisk management system required by GAPIII. Further, as outlined in Appendix 2, "documented biorisk control objectives and targets for an effective control of biorisk at relevant functions and levels in the organization are established, implemented, and maintained." *(GAPIII subelement 1.2.1)* Management establishes the controls and puts in place documented procedures for monitoring their effectiveness to reduce or eliminate the hazards identified in the risk assessment process. *(GAPIII subelement 1.2.2)*

The U.S. NAC requires that PEFs demonstrate conformance to the biorisk management system element in GAPIII. Conformity to this standard may be achieved using a variety of techniques best suited to the institutional mission and needs. A cornerstone of the management system in CWA15793 is the "plan-do-check-act (PDCA) model," commonly

known as the Deming cycle, which is a cyclical feedback process leading to "measurable improvements in an organization's efficiency, effectiveness and accountability". [viii] PEFs may also consider incorporating the international ISO9001:2015 QMS standard to guide development of an appropriate system and process (10). In addition, PEFs may consider adopting an AMP model [assessment (A), mitigation (M), performance (P)] for implementation of biorisk management. [viii] Additional information on risk assessment is provided in the next section.

A biorisk management system must be proactive and not rely solely on failure data. PEFs should establish performance indicators and metrics, such as outcome and activity indicators. For example, outcome indicators could monitor compliance with personal protective equipment (PPE) use, whereas activity indicators would monitor the processes and resources used to ensure appropriate PPE is available in the facility and that personnel have received training and demonstrated competency in its use. [viii]

Due to the complexity of the biorisk management standard, PEFs must establish robust communication and training programs to ensure clear communication and competency of all personnel with access to the PV containment areas or inventory of PV materials. To ensure clear and efficient communication, a communication plan should establish clear communication channels, chain of command, and criteria (*e.g.,* decision tree) and personnel necessary for notification of leadership. All laboratory personnel should have training on hazard assessment to identify potential risks or incident scenarios in the PV containment facility, including source (*i.e.,* cause or condition that is a prerequisite to the event), mechanism (*i.e.*, effect or how the source manifests itself), and outcome (*i.e.,* undesired event resulting from the mechanism and source). [xv] It is essential that personnel supporting PV containment recognize risks that warrant robust risk management.
Further, personnel competency is required *(GAPIII Element 5),* which "is defined in relation to appropriate education, training and/or experience, together with a demonstrable ability to perform the task in a safe/secure manner. No worker should be exempt from demonstrating competence, irrespective of rank, experience or background" *(GAPIII 5.3.1 guidance)*. It is recommended that PEFs pay particular attention to these components due to the importance of worker protection in mitigating a potential PV release.

5.2 Risk Assessment

WHO GAPIII requires that each PEF also establish a robust risk assessment system. Risk assessments are critical for effective biorisk management. While facilities may conduct risk assessments using a variety of methods, U.S.NAC policy requires that PEF risk assessments to address, at a minimum, the items detailed below.

Risk assessment is a core component of a robust and effective biorisk management system. PEFs must ensure the process and inputs into a risk assessment are robust, suitable and effective *[GAPIII Element 2].* For additional resources on risk assessment, refer to GAPIII Annex 5 [ii], the Army Techniques Publication ATP 5-19: Risk Management [xv], the international standard IEC/FDIS 31010: Risk Management – Risk assessment techniques [xvi], the Biosafety in Microbiological and Biomedical Laboratories (BMBL) 6th edition [xvii], Biological Safety: Principles and Practices [xviii], [xix], National Institutes of Health (NIH) Guidelines [xx], Canadian Biosafety Guideline: Local Risk Assessment [xxi], and World Health Organization Laboratory Biosafety Manual 4th edition [xxii].

5.2.1 Risk Assessment System

PEFs shall establish, implement and maintain a risk assessment system *(GAPIII subelement 2.1.1)*. A proactive approach (rather than reactive) for risk assessment is used and defined according to its scope, nature and timing *(GAPIII subelement 2.2.1).* "The risk management system's performance is reported to senior management for review and as a basis for improvement" *(GAPIII subelement 2.1.2)*. It is required that facilities implement performance monitoring of the risk management system. Due to the risk posed by an eradicated pathogen that may cause an asymptomatic infection of vaccinated personnel, facilities must establish metrics related to worker protection, including but not limited to, monitoring adherence to: hand hygiene, use of personal protective equipment, facility biosafety protocols (particularly those related to entrance to and exit from the containment laboratory as well as biological spill response within the containment laboratory), and training requirements. Further, facilities shall monitor incidents or near misses associated with work protocols or the PV containment area. While PEFs may use existing risk assessment processes and practices, the facility must ensure its processes are suitable, proactive, thorough and effective for PV.

The facility must:

- "Identify those operations and activities associated with possible biological risk and where control measures are to be applied." *(GAPIII subelement 2.1.3)*
- Ensure "activities associated with possible biological risk, including maintenance, are carried out under specified conditions." *(GAPIII subelement 2.1.4)*
- Identify resource requirements and provide adequate resources, including "assigning trained personnel to management, work performance and verification activities, including internal review." *(GAPIII subelement 2.3.1)*

"The roles and responsibilities of personnel who perform and verify work affecting risk management should be defined and documented, particularly for people who need the organizational freedom and authority to a. initiate action to prevent or reduce the adverse effects of risk; b. control the further treatment of risks until the level of risk becomes acceptable; c. identify and record any problems related to managing risks; d. initiate, recommend or provide solutions through designated channels; e. communicate and consult internally and externally as appropriate" *(GAPIII subelement 2.3.1 guidance).* Furthermore, it is recommended that a PEF seek periodic external review of its risk assessment system by peers or subject matter experts to ensure the system is comprehensive and effective.

Risk assessments must be documented *(GAPIII subelement 2.5.1)*. PEFs must ensure "suitable methodologies for assessing and recording risks are identified, implemented, maintained" *(GAPIII subelement 2.5.1)*. For example, PEFs must establish methods for hazard identification, analysis of critical control points, identification and implementation of risk controls, and performance monitoring. An all-hazards approach must be used, with both routine and emergency scenarios evaluated. Structured processes are strongly recommended, such as hazard and operability study (HAZOP) [xxiii] and Failure Mode Effects Analysis (FMEA) [xxiv]. Further, the international standard IEC/FDIS 31010 – Risk management – Risk assessment techniques describes and compares risk assessment methods. [xiv]

Risk assessments must be reviewed and approved by the institution's PV biorisk

management committee. Risk assessments must also include input from the scientific manager and relevant technical staff. Note, for occupational health, security and emergency response risk assessments, personnel with relevant subject matter expertise must also be consulted.

5.2.2 Risk Assessment Process

Risk assessments "should follow a structured and repeatable process to allow for comparison of changes over time, to facilitate clear risk communication, and to ensure compliance with risk and decision analysis best practices". [ix] An objective process for risk assessment is implemented, such as tabletop discussion and evaluation of procedures to be used, involvement of personnel familiar with the processes used, and analysis of any incidents associated with a process or the PV containment facility.

The risk assessment process must include:

1. Hazard identification *(GAPIII subelement 2.4)*

"The hazards associated with proposed work are identified and documented." (*GAPIII subelement 2.4.1*) "Unless hazards are identified effectively, it is not possible to assess the risk associated with the facility and its activities." *(GAPIII subelement 2.4.1 guidance)*

"The first stage in the risk management process is to identify all hazards relevant to biorisk. It is useful to involve the whole work team in this process and to use inputs from organizational experts on safety and risk management." *(GAPIII subelement 2.4.1 guidance)*

"A hazard may be a physical situation (*e.g.*, a fire or explosion), an activity (*e.g.*, pipetting) or a material (in this case, the principal hazard is most likely to be a poliovirus, but others include chemicals and asphyxiating gases such as nitrogen). The essence of a hazard is its potential to cause harm, regardless of how likely such an occurrence might be." *(GAPIII subelement 2.4.1 guidance)*

"A hazard identification exercise should use information that includes:

a. group experience and knowledge;
b. external or specialized expertise not found in the facility;
c. results of previous assessments;
d. surveys of previous accidents/incidents;
e. hazardous materials data;
f. information on hazardous organisms;
g. guidelines and codes of practice;
h. facility drawings;
i. SOPs, manuals, etc.;
j. process maps." *(GAPIII subelement 2.4.1 guidance)*

2. Risk assessment *(GAPIII subelement 2.5)*

An important component of a robust risk assessment is recognizing and characterizing the potential risks using an objective process. Quantitative and/or qualitative data is used when available. Risk sources and their environments/scenarios are assessed. The

risk assessment defines the risk sources, work activities and laboratory environment, including locations, procedures and equipment used. Infectious dose, potential transmission routes, virus type, genetic alterations, titer, volume, frequency, physical state (*e.g.,* lyophilized, liquid, frozen) and methods of inoculation (*e.g.,* pipette, syringe) during an experiment should be considered, when known. A risk assessment is also conducted for facility maintenance activities (*e.g.*, replacement of HEPA filters, decontamination of biosafety cabinets prior to certification).

A structured risk analysis is required to establish the nature and level of the risk. Categories (high to low) for both likelihood (probability) and consequence (severity) are defined and considered [xvi, xviii, xix] to determine inherent risk of the activity. The consequence (severity) determination must consider, but is not limited to, a loss of containment, release of PV into the environment, infection of facility personnel or the community, and potential impact on the global eradication of poliomyelitis.
A risk evaluation compares the results of the risk analysis with institutional criteria for risk acceptance or tolerance. The risk evaluation must now consider OPV2 IM and WPV/VDPV IM of all three serotypes in the context of an eradicated pathogen in contrast to prior experience-based risk assessments based primarily on a low likelihood that PV exposure will result in illness or injury to an immunized laboratory worker. Identified risks that do not meet established risk acceptance or tolerance criteria shall require risk controls.

3. Risk control *(GAPIII subelement 2.6)*

   Risk management measures include the hierarchies of control, as applicable, in the following order: elimination of the work, substitution with an alternative organism/activity, engineering controls, administrative controls and PPE. [xxv] *(GAPIII subelement 2.6.1 guidance)* Risk controls are identified to reduce risk to an acceptable level.

   Risk control measures must be indicated (*e.g.,* documented in risk assessments, defined in work-specific protocols) and implemented. Following control measures, residual risk must be documented. Top management has ultimate responsibility to manage and accept this risk for retention of PV at the institution. It is required that top management is notified of and approves risk assessments with a high residual risk level following implementation of identified controls. Top management may delegate approval of moderate or low residual risk levels to the PV biorisk management committee that includes a senior management representative.

   "Suitable methodologies for allocating actions that result from risk assessments, including timelines, responsible persons and associated reporting, and approval mechanisms are identified, implemented, maintained."*(GAPIII subelement 2.6.1)* Further, "the risk management approach should have a control plan that includes who is responsible and accountable for implementing the plan; what resources are to be used (*e.g*., people, budget); a timetable for implementation; details of the mechanism and frequency of reviewing compliance with the plan." *(GAPIII subelement 2.6.1)*

4. Review/reassessment

Risk assessments must be reviewed to ensure control measures are adequate for modifications and procedures at minimum annually or more frequently, as warranted (see Risk Assessment Action Items below). Reviews must be documented.

5. Trial run

If a risk assessment requires modification, facilities should use appropriate controls (*e.g.*, attenuated PV strains exempt from GAPIII or surrogates such as a coxsackie B or echovirus) for any new personnel, new procedures, changes to the facility infrastructure and/or equipment, and/or modified procedures to verify the risk assessment process identified all hazards and risk control measures are comprehensive and effective.

5.2.3 GAPIII Risk Assessments

A risk assessment is required for all work involving eradicated PV materials [6]. Specifically, a separate risk assessment is created for different work activities and laboratory equipment needs, rather than a general risk assessment for PV work. For example, separate risk assessments are conducted for PV cell culture assays, animal studies, serology and immunoassays, nucleic acid extraction and detection, inactivation, and decontamination methods as applicable to the Principal Investigator's work program. In addition, a risk assessment is required for any derogation from WHO GAPIII, including a description of the rationale for the derogation and the GAPIII requirement not adopted.

Additional GAPIII required measures identified through risk assessments include:

A. Removal and exclusion of personnel from the PV facility (temporary and permanent) when deemed necessary (*e.g.*, terminate access to facility upon staffing changes; immediate physical removal of personnel; withdraw access to information systems) *[GAPIII subelement 5.5.1]*
B. Health surveillance program requirements *[GAPIII subelement 9.1.2]*
C. Facility design/redesign process *[GAPIII subelement 12.1]*
D. Physical security controls *[GAPIII subelement 16.1.1]*

Risk assessments are recommended in GAPIII for:

A. Biorisk management *[GAPIII Element 1]*
B. Good microbiological technique control measures *[GAPIII subelement 6.1.2]*
C. Personal protective equipment (PPE) *[GAPIII subelement 7.1]*
D. Risk associated with human behaviors *[GAPIII subelement 8.1.1]*
E. Management of medical and/or environment emergencies *[GAPIII subelement 9.3.1]*
F. Facility maintenance activities *[GAPIII subelement 13.1.1]*
G. Control/calibration/certification/validation of equipment and physical plant *[GAPIII Element 13]*
H. Effective decontamination methods *[GAPIII subelement 14.1.3]*

[6] As declared by WHO, eradicated materials include 1) PV type 2 IM, including wild (WPV2), vaccine derived (VDPV2), and Oral/Sabin (OPV2), 2) WPV2/VDPV2 potentially infectious materials (PIM), 3) wild and vaccine derived PV type 3 (WPV3/VDPV3) IM, and 4) WPV3/VDPV3 PIM.

5.2.4 GAPIII Risk Assessment Action Items

Risk assessments must be created or reviewed upon the following events: *(GAPIII 2.2.1 guidance)*

A. "Commencement of new work or changes to the program of work, including the introduction of new poliovirus material types or alterations to workflow or volume;
B. New construction/modifications to laboratories, plants and equipment or their operation;
C. Introduction of altered and unplanned staffing arrangements, including those concerning contractors, visitors and other noncore personnel;
D. Significant alterations to SOPs or working practices (*e.g.,* disinfection/waste management methodologies, PPE provision or usage, entry and exit protocols);
E. Unexpected events that may be relevant to the management of biorisks;
F. Actual or potential nonconformity with internal/external rules and regulations (*e.g.,* the introduction of new legislation or major accident exposure);
G. Consideration of emergency response and contingency planning requirements;"
H. Annual management review.
I. Non-conformity to GAPIII. PEFs must conduct a thorough risk assessment that is reviewed by an independent third party. Non-conformity risk assessments are also subject to review and approval by U.S. NAC.

6. References

6.1 Internal References

Reference
U.S. NAC *Policy for U.S. Poliovirus-essential facilities to control security of poliovirus materials and information* (Security Policy)
U.S. NAC *Policy for U.S. Poliovirus-essential facilities to manage inventory* (Inventory Policy)
U.S. NAC *Policy For Emergency Response and Exposure Management Plans at U.S. Poliovirus-Essential Facilities* (Emergency Response Policy)
U.S. NAC *Policy For Poliovirus Occupational Health Programs at U.S. Poliovirus-Essential Facilities* (Occupational Health Policy)

6.2 External References

#	Reference
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ii	WHO Global Action Plan, 3rd Edition (GAPIII)
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xxiv	Stamatis D. Failure mode and effects analysis: FMEA from theory to execution. Second edition. American Society for Quality (ASQ). 2003.
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7. Appendices

7.1 Appendix 1. Designated Personnel Roles, Responsibilities and Authorities (excerpted from GAPIII as applicable)

GAPIII	Role	Responsibilities and Authorities

1.3.4/1.3.5	Senior manager *(e.g., leadership within organization)*	Individual(s) "designated with the operational responsibility to oversee the biorisk management system." *(GAPIII subelement 1.3.4)* "Senior managers are those with significant operational, budgetary, and personnel authority at the department or higher level, and may include members of top management" *(GAPIII subelement 1.3.4 guidance).* "The senior manager's functions in managing biorisk include: 1) providing appropriate resources to ensure the adequate provision of personnel, facilities and other resources deemed necessary for the safe and secure operation of the facility; 2) reporting to top management on the performance of the biorisk management system and any need for improvement; 3) ensuring the promotion of the biorisk management system throughout the organization; 4) instituting review, audit and reporting measures to provide assurance that the requirements of this standard are being implemented and maintained effectively." *(GAPIII subelement 1.3.5)* "The senior management representative should be an individual with decision-making authority at a level whereby he/she can allocate resources and make decisions regarding the facility's biorisk management needs ….. independently of the need to implement the program of work." *GAPIII subelement 1.3.5 guidance)*

1.3.8/1.3.9/1.3.10	Biorisk management advisor *(e.g., senior biosafety officer)*	"One or more competent individuals are designated to provide advice and guidance on biorisk management issues" *(GAPIII subelement 1.3.8).* "The competent individual providing advice and guidance on biorisk management is often recognized as a biological safety officer or biological safety adviser. This function should normally be regarded as an advisory position and not one directly responsible for managing biorisk, as that rests with those conducting and managing the work within the organization (*e.g*., the scientific director, principal investigator ….). The role and knowledge of the biorisk advisor are important to develop, implement, maintain and continually improve a biosafety and biosecurity program based on a management system. The advisor should be competent to perform the role and be allocated sufficient time and other resources to do the job effectively" *(GAPIII subelement 1.3.8 guidance)* "The biorisk management advisor's role is independent of the functions of those responsible for implementing the program of work." *(GAPIII subelement 1.3.9)* "The biorisk management advisor: 1) reports directly to the responsible senior manager; 2) has delegated authority to stop work in the event that it is considered necessary to do so." *(GAPIII subelement 1.3.10)* "The biorisk management adviser's functions should include, but are not limited to: a. verifying, in conjunction with other relevant personnel, that all relevant biorisk considerations have been addressed; b. advising or participating in the reporting, investigation and follow-up of accidents/incidents and, where appropriate, referring these to management and/or the biorisk management committee; c. ensuring relevant and up-to-date information and advice on biorisk management are made available to scientific and other personnel as necessary; d. advising on biorisk management issues within the organization; e. contributing to the development and/or delivery of biorisk training activities; f. ensuring all relevant activities are performed in compliance with biorisk regulations, and the required biorisk authorizations for work are in place." *(GAPIII subelement 1.3.10 guidance)* In addition, the biorisk management advisor should advise and participate in developing and communicating lessons learned as an outcome of incident investigations, when appropriate.

n/a	Biosafety officer	Individual most familiar with the PV containment areas and staff. The role should include performing periodic biosafety inspections or audits of the PV containment area and inventory and contributing to risk analyses.
1.3.11/1.3.12	Scientific manager *(e.g., principal investigator)*	"One or more individuals with responsibility for the scientific program within the facility have been designated with responsibilities relevant to biorisk management." *(GAPIII subelement 1.3.11)* "The scientific manager is responsible for managing the scientific program within the facility on a day-to-day basis, and for implementing and monitoring biorisk controls in association with other facility personnel (*e.g.* adhering to policies and procedures, monitoring staff performance and participation in inspections and audits). The individual would normally have an in-depth knowledge of the work program and the facility, would be in a supervisory/management position and may be referred to as Head of Department, Principal Investigator, Laboratory Supervisor/Manager or Group Leader. Competence is required in technical/scientific aspects of the poliovirus materials being used and in their control, and in the management of the facility, its personnel and systems. More than one individual may hold similar roles, but in such instances the responsibilities should be clearly defined to avoid any omissions and ensure consistency." *(GAPIII subelement 1.3.11 guidance)* "The scientific management functions include: 1) ensuring all work is conducted according to established policies and guidelines described in this standard; 2) supervising workers, including ensuring only competent and authorized personnel can enter and work in the facility; 3) planning and conducting work activities, and ensuring adequate staffing levels, time, space and equipment are available; 4) ensuring required authorizations for work are in place; 5) ensuring laboratory biosafety and laboratory biosecurity risk assessments have been performed, reviewed and approved, and the required control measures are in place; 6) ensuring all at-risk employees have been informed of risk assessments and/or provisions for any recommended precautionary medical practices (*e.g.*, vaccinations or serum collections)." *(GAPIII subelement 1.3.12)*

n/a	Laboratorian designee	One or more individuals are designated to represent laboratory staff that perform hands-on work in the PV containment area in the biorisk management system. The role contributes to risk analyses and practical applications for the work activities conducted.
1.3.13	Occupational health professional *(e.g., competent medical authority)*	"The organization has access to appropriate occupational health expertise." *(GAPIII subelement 1.1.13)* "The occupational health professional would normally be a medical doctor or occupational health nurse with an understanding of the poliovirus materials handled within the facility. The role should include providing input into risk assessment from a worker's health perspective, advising on first aid/emergency treatment measures and follow-up, liaising with external health-care providers, and coordinating medical examinations, surveillance and vaccination programs." *(GAPIII subelement 1.3.13 guidance)*
1.3.15	Facility manager *(e.g., facility engineer, facility maintenance supervisor)*	"One or more facility managers have been appointed with responsibilities relevant to facilities and equipment." *(GAPIII subelement 1.3.15)* "The facility manager would normally be an engineer or a person with an in-depth knowledge of laboratory facilities, containment equipment and buildings. The role should include providing input into risk assessment from a facility perspective, coordinating building and maintenance work, and liaising with contractors." *(GAPIII subelement 1.3.15 guidance)*
1.3.16	Security manager	"A security manager has been designated with responsibilities conforming to requirements set out in this polio biorisk management standard." *(GAPIII subelement 1.3.16)* "The security manager would normally have an in-depth knowledge of laboratory and facility security, should liaise with other personnel (*e.g.*, biorisk management advisor) and implement effective and proportionate laboratory biosecurity measures, based on the biological risk. The role should include providing input into risk assessment and management from a security perspective." *(GAPIII subelement 1.3.16 guidance)*

1.3.17	Animal care manager (if applicable)	"In laboratories where animals are kept, an animal-care manager has been designated with responsibilities conforming to requirements set out in this polio biorisk management standard." *(GAPIII subelement 1.3.17)* For facilities where animal work with PV materials are performed, "the animal care manager would normally have an in-depth knowledge of animal handling, and zoonotic and animal diseases. The animal-care manager should liaise with other personnel (*e.g.*, biorisk management advisor, occupational health professional) to implement effective and proportionate laboratory biosafety and biosecurity measures. A qualified veterinarian should be available for additional advice. The role should include providing input into risk assessment and management from an animal-care perspective." *(GAPIII subelement 1.3.17 guidance)*
n/a	Animal care staff designee (if applicable)	For facilities where animal work with PV materials are performed, one or more individuals are designated to represent animal care staff that perform hands-on work in the PV containment area in the biorisk management system. The role contributes to risk analyses and practical applications for the work activities conducted.
n/a	Quality manager	One or more individuals are designated to represent quality assurance in the biorisk management system. The role provides support to the biorisk management system for quality assurance, records, documents and data control, as well as other quality indicators.

7.2 Appendix 2. Biorisk Management System Requirements (excerpted from GAPIII)

GAPIII	Requirement and Guidance
1.4	**Records, Documents and Data Control**
1.4.1	"Records, documents and data are established, controlled and maintained to provide evidence of conformity to the requirements of this poliovirus biorisk management standard." *(GAPIII subelement 1.4.1)*
1.4.2	"Records, documents and data are handled in such a way that they remain legible, readily identifiable and retrievable." "Documented records are maintained in paper or electronic form for a minimum of 10 years from the day of the withdrawal" and are available for review during containment certification audits. *(GAPIII subelement 1.4.2)* If not already in place, the collection and retention of records, documents and data should start immediately.
1.5	**Analysis of Data**

GAPIII	Requirement and Guidance
1.5.1	"Appropriate data are determined, collected and analyzed to assess the suitability and effectiveness of the biorisk management system and to evaluate where continual improvement of the system can be made." *(GAPIII subelement 1.5.1)* "The analysis should include data generated as a result of monitoring, measurement, audits and analysis, and from other sources. Such analyses should be conducted at least annually, and more often if justified by the risks and scope of operations. The results of the analysis should be applied in the management review." *(GAPIII subelement 1.5.1 guidance)*
1.6	**Change Management**
1.6.1	"All changes associated with the design, operation and maintenance of the facility are subject to a defined and documented change management process." (*GAPIII subelement 1.6*) "These changes should be reviewed, verified and validated as appropriate, and approved before implementation. This should include an evaluation of the effect of the changes on the risk assessment. Examples of changes that should be subject to the change management process include: a. modifications to buildings and equipment or their operation, which could or would have an effect on biorisk; b. introduction of altered staffing arrangements (such as the temporary presence of on-site contractors or students, temporary reassignments of personnel); c. changes to the program of work, including alterations to workflow or volume, which could or would have an effect on biorisk; d. alterations to SOPs, including significant changes in materials or reagents; e. modifications to entry/exit protocols; f. modifications to personnel policies and visitor protocols; g. modifications to disinfection, decontamination and other waste management methodologies; h. changes associated with the provision and use of personal protective equipment (PPE)." *(GAPIII subelement 1.6.1 guidance)*
1.7	**Consultation and Communication**

GAPIII	Requirement and Guidance
1.7.1	"Relevant biorisk information related to an organization's activities is communicated to and from employees and other relevant parties" *(GAPIII subelement 1.7.1)* "The organization should implement mechanisms to ensure relevant and current information that can potentially affect workers and others is defined and delivered effectively at appropriate intervals. This could entail regular team meetings and briefings in the workplace, as well as formal training sessions. In addition to facility personnel, it may also be appropriate to engage others, including: a. local, national and international governmental organizations; b. relevant regulatory agencies; c. certifiers; d. emergency services and health-care providers; e. contractors and suppliers (*e.g.*, cleaners, maintenance providers, security personnel); f. local community representatives (*e.g.*, through a community liaison committee). Systems should be put in place to identify existing or emerging technologies or other relevant information related to the containment of the poliovirus materials being handled or stored. This information should be shared with relevant staff through appropriate media, including the circulation of appropriate signage, documents and team briefings, and the maintenance of reference libraries and other sources of information." *(GAPIII subelement 1.7.1 guidance)*
1.7.2	"Employee involvement and consultation arrangements are documented." *(GAPIII subelement 1.7.2)*
1.7.3	"Personnel have access to adequate and up-to-date information about the organization's biorisks." *(GAPIII subelement 1.7.3)*
1.8	**Program of Work**
1.8.1	"The program of work for the facility is defined, documented and reviewed." *(GAPIII subelement 1.8.1)* "The program should include the nature of the activities authorized to be conducted in the facility and their definitions (*e.g.*, diagnostics, research, small scale/large scale). All activities associated with the work program should be specified and supported by formal SOPs approved in line with the requirements for controlled documents, as defined by this standard. Any changes to the program of work should be subject to a formal change management process." *(GAPIII subelement 1.8.1 guidance)*
1.8.2	Criteria are established for work that requires prior approval.
1.9	**Work Planning and Capacity**

GAPIII	Requirement and Guidance
1.9.1	"Sufficient resource capacity and capability are available to manage workflow, whether planned or unplanned." *(GAPIII subelement 1.9.1)* "The resources needed to implement and maintain the biorisk management system and continually improve its effectiveness should be determined and provided." *(GAPIII subelement 1.9.1 guidance)*
1.10	**Legal Requirements**
1.10.1	"The organization ensures that all relevant requirements are identified and fulfilled within the biorisk management system. Legal requirements include national/federal, regional/state, provincial, city and local regulations with which the organization must comply." *(GAPIII subelement 1.10.1)* "The organization should adopt measures to identify the facility's legal and other requirements related to the poliovirus materials to be held and used, but also to other regulations including, for example, worker protection and rights, environmental impact, and general health and safety (*e.g.*, fire, electrical). Monitoring for new and upcoming requirements, as well as those that already exist, is needed. This information should be kept up to date and the requirements should be incorporated into the facility's biorisk management system." *(GAPIII subelement 1.10.1 guidance)*
1.11	**Continual Improvement**
1.11.1	"The organization continually improves the effectiveness of the biorisk management system through: • the policy; • its objectives; • the self-audit program; • audit results; • the analysis of data; • the risk assessment; • corrective and preventive actions; • the management review." *(GAPIII subelement 1.11.1)* "The organization should strive to continue developing and refining the systems in place to ensure that further opportunities to improve are identified and implemented. This may be achieved by setting objectives and giving targets to those working within the facility and by monitoring progress to ensure the objectives are achieved." *(GAPIII subelement 1.11.1 guidance)*
1.12	**Preventive Action**

GAPIII	Requirement and Guidance
1.12.1	"Action is taken to identify and eliminate the causes of potential nonconformities to prevent their occurrence." *(GAPIII subelement 1.12.1)* "A procedure should be established to define requirements for: a. determining the potential nonconformities and their causes; b. evaluating the need for action to prevent the occurrence of nonconformities; c. determining and implementing the action needed; d. recording the results of action taken; e. reviewing the preventive actions taken." *(GAPIII subelement 1.12.1 guidance)*
1.12.2	"Preventive actions are appropriate to the effects of the potential nonconformities." *(GAPIII subelement 1.12.2)*
1.13	**Control of Nonconformities**
1.13.1	"Situations that do not conform to the requirements of this polio biorisk management standard are identified and controlled to prevent undesirable consequences." *(GAPIII subelement 1.13.1)* "The controls and related responsibilities and authorities needed to deal with nonconforming situations should be defined in a procedure." *(GAPIII subelement 1.13.1 guidance)*
1.13.2	"Records are maintained of the nature of the nonconformity and any subsequent action taken. "*(GAPIII subelement 1.13.2)*
1.14	**Inspection and Audit**
1.14.1	"An inspection and audit program is conducted that is appropriate to the risk associated with the facility." *(GAPIII subelement 1.14.1)* "Inspections may be frequent checks of specific areas, conducted to ensure sufficient standards are being maintained (*e.g.*, disinfectant levels/concentrations, air exchange rates/ maintenance of directional air flow), or may be more extensive but less frequent inspections of laboratories, facilities or other operations. Random, unannounced inspections and inventory audits can help ensure compliance at all times and not just in time for scheduled inspections. Audits should be performed by competent individuals unaffiliated with the audited activity. Records of inspection/audit findings should be maintained, including action taken to close out any nonconformities or pursue improvement opportunities." *(GAPIII subelement 1.14.1 guidance)*
1.14.2	[Self]-"inspections and audits are conducted at planned intervals to determine if the biorisk management system conforms to the documented plans and the requirements of this poliovirus biorisk management standard, and if it is effectively implemented and maintained." *(GAPIII subelement 1.14.2)*
1.14.3	"Management responsible for the area being inspected/audited ensures that any actions are taken without undue delay to eliminate detected nonconformities and their causes." *(GAPIII subelement 1.14.3)*

GAPIII	Requirement and Guidance
1.14.4	"Follow-up activities include: 1. verification of the actions taken; 2. reporting of the verification results." *(GAPIII subelement 1.14.4)*
1.15	**Corrective Action**
1.15.1	"To prevent the recurrence of any nonconformities, action is taken to eliminate their causes using the requirements of the poliovirus biorisk management standard for poliovirus-essential facilities holding wild poliovirus materials." *(GAPIII subelement 1.15.1)* "A procedure should be established to define requirements for: a. reviewing the nonconformities; b. determining the cause of nonconformities; c. evaluating the need for action to ensure nonconformities do not recur; d. determining and implementing the action needed; e. recording the results of action taken; f. reviewing the corrective actions taken." *(GAPIII subelement 1.15.1 guidance)*
1.15.2	"Corrective actions are appropriate to the effects of the nonconformities encountered." *(GAPIII subelement 1.15.2)*
1.16	**Contractors and Suppliers**
1.16.1	"Purchases (including services) conform to specified requirements." *(GAPIII subelement 1.16.1)*
1.16.2	"Controls on purchases (including services) are applied depending on the potential impact on the biorisk involved." *(GAPIII subelement 1.16.2)*
1.16.3	"Suppliers are evaluated and selected based on their ability to provide products/services that meet the requirements of this poliovirus biorisk management standard." *(GAPIII subelement 1.16.3)* "While not all suppliers will provide products/services that may have an impact on biorisk, many may. Suppliers that should be considered include, but are not limited to, those that provide: a. cleaning services; b. laboratory equipment; c. waste management or disposal services; d. information technology support services; e. equipment and facility maintenance services; *f.* security services." *(GAPIII subelement 1.16.1 guidance)*
1.16.4	"Criteria for selection, evaluation and re-evaluation are established." *(GAPIII subelement 1.16.4)*
1.16.5	"Records are maintained of evaluation results and any necessary actions arising from the evaluation." *(GAPIII subelement 1.16.5)*

8. Version History

Version	Change Summary	Effective Date
01	New document	4/14/2020
02	Document updated to include all PV IM, including WPV1, in addition to reformatting the policy to new NAC template.	02/29/2024

9. Acknowledgments

Prior to publication, U.S. NAC policies are developed in consultation with biosafety, biosecurity, legal, poliovirus, public health subject matter experts as well as poliovirus-essential facilities; endorsed by the CDC Officer of Readiness and Response, Board of Scientific Counselors; and reviewed by CDC technical experts and leaders. This U.S. NAC policy is a living document and subject to ongoing improvement. Please submit feedback or suggestions to poliocontainment@cdc.gov.