



Ministry of
Health

British Columbia
Professional and Software Conformance Standards

Electronic Health Information Exchange

Volume 2: Information Privacy & Security

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Author: MOH Health Digital Policy, Security and Privacy Branch

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1.0 Information Privacy and Security

The rules in this volume define the mandatory standards for all software organizations.

Each standard will be evaluated by one or more of the following processes:

- (A) Attest by signing the Vendor Participation Agreement that your product conforms to the stated standard and that documented policy and procedures are maintained for internal purposes or to support an audit;
- (C) Attest to as indicated in (A) and provide a comment.
 - The comment must provide a high-level description of how your product conforms to the stated standard; and
- (D) Attest to as indicated in (A) and demonstrate that your product conforms to the stated standard.

1.1 General Privacy and Security

This section describes the information privacy and security rules that apply to all organizations developing interfaces to health information exchange (HIE) services offered by the Ministry of Health (the “ministry”).

Table 1 General Privacy and Security Rules

#	Rule	Evaluation Method
PS1.1	Access, Disclosure and Storage Outside of Canada Access to, disclosure and storage of electronic health information must be within Canada unless permitted in writing by the ministry in accordance with applicable laws.	A
PS1.2	Guiding Principles for Personnel Restricted Data Access Processes and procedures must be in place to ensure that access privileges to EHI data is based on the following principles: <ul style="list-style-type: none"> a) <u>Need to Know</u>: Users or resources should be granted access to systems strictly on requirements to fulfill their roles and responsibilities. b) <u>Least Privilege</u>: Employ a least privileges model for the user and service accounts that run the application. The application must run at the user privilege level and not system/root level. 	A
PS1.3	Authentication Settings All default authentication settings for high-level privileged accounts (e.g., those used to perform application administration) must be changed before the application is fully deployed.	C

2.0 Application Development

This section describes the information privacy and security rules that apply to all software solution organizations developing interfaces to health information exchange (HIE) services offered by the Ministry of Health (the “ministry”).

2.1 Secure Development

Table 2 Secure Development Rules

#	Rule	Evaluation Method
PS2.1	Development Lifecycle The organization must follow an application development life cycle methodology, which addresses information security throughout the phases of the Secure System Development Life Cycle.	A
PS2.2	Use and Segregation of Production Environment The production environment (i.e., the operational information system) must be segregated from development, testing and training environments and must not be used for application development, testing or training.	C
PS2.3	Personnel Assignments There must be a separation of duties between personnel assigned to develop software in development environments and those assigned to maintain software in production environments.	C
PS2.4	Change Management A formal and structured change management process (i.e., ITIL Best Practices for Service Management) must be used with procedures to control the implementation of software and upgrades for system components and software. The application must be reviewed and tested after materially modified, enhanced or updated, to ensure no adverse impact on organizational operations or security.	A

#	Rule	Evaluation Method
PS2.5	<p>Vulnerability and Patch Management</p> <p>A Vulnerability and Patch Management (VPM) Policy must be followed in applying security patches for application hosting environment system components and software that access/exchange electronic health information.</p> <ul style="list-style-type: none"> a) Systems must be patched regularly to ensure current OS and application component levels; and b) Critical, high and medium vulnerabilities must be remediated through: <ul style="list-style-type: none"> i. Patching; ii. Decommission; or iii. Compensating controls if there is a technical or business reason why the patches cannot be applied. <p>Note(s): Refer to the OCIO Patch Standard to understand the current patching expectations for vulnerable systems based on risk rating.</p>	C
PS2.6	<p>Key Management</p> <p>Key management must be documented and performed in accordance with the following requirements:</p> <ul style="list-style-type: none"> a) File encryption keys are recoverable; b) If a file encryption key is backed up, it must be encrypted; and c) All access to the backed-up key is recorded in an audit trail. 	A
PS2.7	<p>Inactive Test Accounts</p> <p>A test account inactive (or not activated) for greater than 45 days is considered dormant and must be:</p> <ul style="list-style-type: none"> a) Removed from the system; or b) Disabled to prohibit login to the system. 	C
PS2.8	<p>Test Data</p> <p>All data in non-production environments must be fictitious.</p> <p>Test data must be removed of all personal or sensitive information, de-personalized or modified beyond recognition before usage.</p>	C

#	Rule	Evaluation Method
PS2.9	Application Modification The ministry must be notified when the application has been materially modified, enhanced or updated where upon the application will be conformance tested at the discretion of the ministry.	A

2.2 Application Audit Functionality

Table 3 Application Audit Functionality Rules

#	Rule	Evaluation Method
PS3.1	<p>Logging Access</p> <p>The application must create a timestamped audit record each time a user (including all privileged users, such as system administrators):</p> <ul style="list-style-type: none">a) Accesses, creates or updates electronic health information; andb) Logs in or out of the system. <p>Note(s): The application should have the capability to provide audit logs to a Security Information and Event Management (SIEM) tool.</p>	D

#	Rule	Evaluation Method
PS3.2	<p>Content of Audit Logs</p> <p>The application must record the following information for each event:</p> <ul style="list-style-type: none"> a) User identification; b) User role; c) Date and time; d) Success or failure indication; e) Origin of event (e.g., health organization, informational custodian, physical/departmental location or virtual location/identifier); f) Originating IP address; g) Domain or repository accessed; h) Type of event, activity or function performed (e.g., create, view, update, print); i) Type, identity or name of affected data, system component, or resource; and j) Transaction number or ID. <p>In order to protect patient privacy and meet legislative or regulatory requirements, user activity audit logs must not capture any patient clinical or demographic information.</p> <p>Note(s):</p> <ul style="list-style-type: none"> 1. PharmaNet Audit Logs are permitted to capture patient demographic information. 2. The details of the PharmaNet Audit Log can be found in Volume 4C (Application Enforced Rules – PharmaNet). 	D
PS3.3	<p>Audit Log Retention</p> <p>Audit logs must be retained for a minimum of two years or as prescribed in regulation.</p> <p>Note(s): Refer to Volume 4C (Application Enforced Rules – PharmaNet) for additional details regarding record of PharmaNet access/transmission.</p>	C

#	Rule	Evaluation Method
PS3.4	Access Audit Reports The application must be capable of generating user defined reports to provide, at a minimum: <ul style="list-style-type: none"> a) <u>Reports by patient</u>: Identifying all users who have accessed, or modified a given patient's record(s) over a given time; and b) <u>Reports by user</u>: Identifying all records accessed or modified by a given user over a given period. 	D
PS3.5	No Logging of EHI Data for Other Purposes Electronic health information must not be logged other than that information required under PS3.2 or as required in other volumes of these Conformance Standards.	A
PS3.6	Disposal of Audit Logs Once the required retention period has ended audit logs must be securely disposed.	C
PS3.7	Integrity of Log Files Audit logs (including any backup copies) must be secured so that the information contained within them cannot be altered, to the same extent as the EHI which they refer to.	C
PS3.8	Logging of Faults The application creates log records when unexpected errors occur.	C & D

2.3 Application Accounts and System Access

Table 4 Application Accounts and System Access Rules

#	Rule	Evaluation Method
PS4.1	<p>Account Lock Out</p> <p>An account lockout threshold must be set to a maximum of six consecutive failed attempts.</p> <p>After reaching an account lockout threshold the logon process must:</p> <ul style="list-style-type: none"> a) Lock the account and require administrator intervention; or b) Lock the account for a minimum of 15 minutes and then reset the account lockout counter back to zero. 	D
PS4.2	<p>Access Control</p> <p>The application must incorporate an effective security scheme that will:</p> <ul style="list-style-type: none"> a) Require authentication for system access such as a user ID and password or two-factor authentication (preferred). b) Control system access (by adding or removing/disabling/decommissioning user identifiers); c) User IDs are unique; and d) User IDs can be decommissioned, or have permissions removed, and that decommissioned user IDs cannot be re-used. <p>Note(s): Ministry system authentication requirements such as referencing/using external federated authentication solutions have yet to be determined.</p>	C & D
PS4.3	<p>Privileged User Access</p> <p>A privileged user ID, defined as having administrative access to network and operating system infrastructure with the ability to control security access and other restricted system functions, must not have the ability to access the HIE system.</p>	C & D

#	Rule	Evaluation Method
PS4.4	<p>Multi-factor Authentication Credentials</p> <p>If multi-factor authentication is used, the associated password, passphrase or passcode must be a minimum length of 6 characters.</p> <p>Note(s): Passwords, passphrases or passcodes should be changed at least annually.</p>	D
PS4.5	<p>Role Based Access</p> <p>The application must allow an administrator to create, update and report upon the permissions associated with user roles and the roles assigned to users, and have role-based access controls which can:</p> <ul style="list-style-type: none"> a) Map a user to one or more roles; b) Map each role to one or more system functions; c) Create new roles; and d) Restrict/limit access to system function or data based on role. 	C & D
PS4.6	<p>Single Role per Session</p> <p>If a user ID supports multiple roles, the application must:</p> <ul style="list-style-type: none"> a) Prompt the user to select from the assigned roles; and b) Apply the permissions for only the selected role. <p>The user ID must not be given aggregate permissions for all their assigned roles.</p>	D
PS4.7	<p>Role-based Functionality</p> <p>The application must provide and restrict functionality in full accordance with the user's business role and user's provincial EHR Service business role.</p>	D
PS4.8	<p>Secure Sign-on Configuration</p> <p>The application must securely manage user sessions by:</p> <ul style="list-style-type: none"> a) Validating sign-on information only when it has all been entered; and b) Limiting the duration of any one sign-on session. 	C & D

#	Rule	Evaluation Method
PS4.9	<p>Sign-on Display and Warnings</p> <p>Application sign-on mechanisms for user sessions must be configured so they:</p> <ul style="list-style-type: none"> a) Do not display specific electronic health information details until after sign-on is completed successfully; and b) Warn that only authorized users are permitted access. 	D
PS4.10	<p>Session Inactivity</p> <p>The application must clear the screen of personal and confidential information when a session has been inactive after a configurable period (maximum of 15 minutes) using, for example, locking screensavers or automatic disconnection of inactive sessions.</p> <p>The screen must remain clear of personal and confidential information until an authorized user successfully enters a valid user ID and password, or two-factor credentials.</p>	D
PS4.11	<p>Managing User Passwords</p> <p>The application must use the following password management features:</p> <ul style="list-style-type: none"> a) Passwords are not displayed on screen or on print-outs; b) Temporary passwords issued to users are changed on first use; c) New passwords are verified before the change is accepted; d) Users set their own passwords and can change them at any time; e) A password complexity setting; f) A password change frequency setting; g) Upon password expiration, the user is instructed (forced) to immediately assign a new password; and h) A password history setting where re-use of passwords is restricted (i.e., so the password cannot be used again within a set period or set number of changes). 	D

#	Rule	Evaluation Method
PS4.12	<p>Password Protection</p> <p>Passwords must be protected (i.e., not sent/stored in clear text) when transmitted or stored by the application.</p> <p>Each password must be individually protected with one of the following methods:</p> <ul style="list-style-type: none"> a) Concatenate the password to a salt or nonce and/or username, then hash (SHA-256); or b) Encrypt the password with a keyed encryption algorithm (AES-256); or c) An alternate technical solution submitted to and approved by the Province. 	C & D
PS4.13	<p>Sign-on Mechanism and Passwords</p> <p>Accounts, user IDs and passwords must not be embedded in the source code or in automated (batch) routines.</p>	D
PS4.14	<p>Remote Access to the Application</p> <p>Remote access to the application must have in place the following controls:</p> <ul style="list-style-type: none"> a) Secure remote access technologies such VPN, firewall rules, authentication, encryption (minimum AES-128 bit); b) Audit and monitoring processes during the remote access sessions; c) Automatic disconnect of sessions after a specific period of inactivity; d) Unique identifiable user IDs; e) Multi-factor authentication; f) Devices that meet minimum security configuration (e.g., up-to-date malware protection, latest systems and software patches installed, personal firewall); and g) Accessed from a location within Canada, unless otherwise permitted in writing by the ministry in accordance with applicable laws. 	C
PS4.15	<p>Inactive User Accounts</p> <p>A user account inactive for 90 days or greater is considered dormant and must be disabled to prohibit login to the system.</p>	D

#	Rule	Evaluation Method
PS4.16	New User Account Pending Activation A new user account not activated within 5 business days or greater from the day of the activation notice is considered dormant and must be disabled to prohibit login to the system.	C

2.4 Patient's Access Word

A patient's Access Word is a password chosen by the patient, used to control access to the patient's electronic health record.

There are two types of Access Words:

- Disclosure Directive Keyword (for PLIS):
 - A Disclosure Directive is initiated by the patient to protect their electronic health information (EHI) in the Provincial Laboratory Information Solution (PLIS).
- Patient Protective Word (for PharmaNet):
 - A Patient Protective Word is initiated by a patient's request through a pharmacist or HIBC to protect their EHI in PharmaNet.

Table 5 Patient's Access Word Rules

#	Rule	Evaluation Method
PS5.1	<p>Securing Patient's Access Word</p> <p>A patient's access words stored in the POS application must be individually protected by one of the following methods:</p> <ul style="list-style-type: none"> a) Encrypt the patient's access word with a keyed encryption algorithm (AES-256); or b) An alternate technical solution submitted to and approved by the Province. 	C & D

2.5 Application Coding and Vulnerability Review

Table 6 Application Coding and Vulnerability Review Rules

#	Rule	Evaluation Method
PS6.1	<p>Protecting Against Unauthorized Access</p> <p>The application must be protected against unauthorized access to information by:</p> <ul style="list-style-type: none"> a) Employing secure defaults (including logging is active by default); b) Ensuring key components ‘fail securely’ (i.e., in the event of system failure, information is not accessible to unauthorized individuals, and cannot be tampered with or modified); and c) Not disclosing information about its internal workings (e.g., in application responses or error messages). 	C
PS6.2	<p>Secure Code Review</p> <p>Application code must be reviewed prior to release to production in order to identify any potential coding vulnerability.</p> <p>Software remediation must be prioritized according to criticality (Critical, High and Medium vulnerabilities) and completed before the application is released to production.</p> <p>Note(s):</p> <ul style="list-style-type: none"> 3. Secure code reviews should be performed by individuals other than the original code author who are knowledgeable in code review techniques and secure coding practices. 4. This is also called a Static Application Security Test (SAST). 	D
PS6.3	<p>Secure Coding Requirements</p> <p>Application code must be tested and remediated for, at a minimum, the common coding vulnerabilities:</p> <ul style="list-style-type: none"> a) Injection flaw; b) Buffer overflow; c) Insecure cryptographic storage; d) Insecure communication; and e) Improper error handling. 	D

#	Rule	Evaluation Method
PS6.4	Cryptographic Keys Cryptographic keys stored within the application must be protected.	C
PS6.5	Electronic Health Information Transmission The application must apply cryptographic algorithms and protocols during transmission of electronic health information outside the application when any of the following three conditions occur: <ul style="list-style-type: none"> a) the data is transmitted beyond a single physical network; or b) the network is shared by more than one business entity; or c) transmission is over public networks. Note(s): The application should be designed to accept future cryptographic specifications or requirements of ministry systems.	C
PS6.6	Data Retention Data must be retained for a defined period of time as required by applicable laws, bylaws and regulations.	C
PS6.7	Caching Caching of transactional data must only occur for the duration necessary to process the transaction.	C
PS6.8	Transaction Log for Technical Support Transaction logs that contain full message details must only be used for technology support purposes.	A
PS6.9	Transaction Log Security In cases where full message details are logged, the confidentiality of the information must be protected at minimum with the following security controls: <ul style="list-style-type: none"> a) Encryption (AES-256 or stronger); b) Role-based access controls; and c) Logging all individual accesses to transaction log. 	C

#	Rule	Evaluation Method
PS6.10	Transaction Log Content Limitation In cases where full message details are logged, the patient's access word must not be stored in the transaction log.	A
PS6.11	Transaction Log Retention In cases where full message details are logged, transaction logs must be retained for a maximum of one week (i.e., seven days). Note(s): Refer to Volume 4C (Application Enforced Rules – PharmaNet) for additional details regarding storage of PharmaNet response data.	C
PS6.12	Disposal of Transaction Logs Once the required retention period has ended, transaction logs must be securely disposed.	C
PS6.13	Data at Rest Security The application must have appropriate security controls to protect the data at rest from unauthorized access. The controls to protect the data at rest include, but are not limited to: <ul style="list-style-type: none"> a) file system or database access control; and b) data encryption (AES-256 or stronger). Encryption is mandatory for all on premises hosted solutions.	C
PS6.14	Information Leakage in Error Messages Sensitive information about the application such as usernames, passwords, machine names, file location and sensitive debugging information must not be displayed.	C

#	Rule	Evaluation Method
PS6.15	<p>Application Vulnerability Scanning</p> <p>Regular application vulnerability scanning (i.e., automated tools and/or manual methods) must be used to validate that the application is not susceptible to known vulnerabilities.</p> <p>No new information system shall be considered in production until:</p> <ul style="list-style-type: none"> a) vulnerability assessment(s) have been conducted (as necessary); and b) Critical, High, and Medium vulnerabilities addressed. <p>At the completion of all vulnerability assessments, any vulnerabilities must be documented and remediated.</p> <p>Records of all assessments must be kept, and copies be made available if requested by the Ministry or an external auditor.</p> <p>Note(s):</p> <ol style="list-style-type: none"> 1. This is also called a Dynamic Application Security Test (DAST). 2. Examples of when vulnerability assessments must be completed include (but are not limited to): <ul style="list-style-type: none"> • At the completion of the operating system installation and patching phase; • At the completion of the installation of any vendor provided or in-house developed application; • Just prior to moving the information system into production; • After finalizing an image or template designed for deployment of multiple devices; • For vendor provided information systems, prior to user acceptance testing and again before moving into production; and • For all new supporting network infrastructure equipment, during the burn in phase and prior to moving to production. 	D

#	Rule	Evaluation Method
PS6.16	<p>Public Key Cryptography</p> <p>If public key cryptography is being applied in circumstances not covered by any other standard in this volume set, one of the following choices must be used:</p> <ul style="list-style-type: none"> a) RSA based cryptography; <ul style="list-style-type: none"> i. The RSA key size MUST be no less than 1024 bits; ii. The RSA key size SHOULD be 2048 bits; b) Elliptic curve cryptography (ECC); <ul style="list-style-type: none"> i. ECC curve and key parameters must be selected from among those recommended in FIPS 186-3, APPENDIX D. <p>The bit length of 'n' specified in Table D-1 MUST be no less than 224.</p>	A
PS6.17	<p>Block Cypher</p> <p>If a block cypher is being applied in circumstances not covered by any other standard in this volume set, Advanced Encryption Standard (AES), NIST – FIPS 197 must be used.</p> <p>The AES key size must be no less than 256 bits.</p>	A
PS6.18	<p>Hash Function</p> <p>If a hash function is being applied in circumstances not covered by any other standard in this volume set, the Secure Hash Algorithm as specified in NIST - FIPS PUB 180-3 must be used.</p> <p>The block size must be no less than 256 bits (i.e. SHA-256).</p>	A
PS6.19	<p>X.509 Certificate Authentication</p> <p>If a certificate is used for multi-factor authentication, it must be based on a X.509 certificate stored on a tamper-resistant device.</p> <p>The certificate should meet FIPS 140-2 Level 2.</p>	C

#	Rule	Evaluation Method
PS6.20	<p>SFTP</p> <p>If SSH File Transfer Protocol Version 2 (commonly referred to as SFTP) is used:</p> <ul style="list-style-type: none"> a) The encryption algorithm must be AES with a minimum key length of 256 bits; and b) Both client and server authentication must be based on public key cryptography. 	A
PS6.21	<p>FTPS</p> <p>If FTP over TLS/SSL (commonly referred to as FTPS) is used:</p> <ul style="list-style-type: none"> a) The encryption algorithm must be AES with a minimum key length of 256 bits; b) Both control and data channels MUST be encrypted; and c) Both client and server authentication must be based on public key cryptography. 	A
PS6.22	<p>Extracted EHI Data</p> <p>EHI extracted from a Ministry HIE (i.e., CR, PLIS, PLR, PNet) must not be stored on end user devices or portable media.</p>	A

2.6 Web Application

Table 7 Web Application Rules

#	Rule	Evaluation Method
PS7.1	Protecting Against Data Corruption or Disclosure Information used by web applications (e.g., configuration files) must be protected against corruption or unauthorized disclosure by: <ul style="list-style-type: none"> a) Using partitions inaccessible to web servers (or other connected servers); b) Restricting file permissions; and c) Encrypting all the connection strings stored on the web server. 	C
PS7.2	Preventing Information Leakage The unauthorized disclosure of system configuration information (that could be useful to hackers) must be prevented by, at a minimum: <ul style="list-style-type: none"> a) Suppressing or modifying the server field in HTTP headers that identify the web server's brand and version; b) Verifying that directories of files on web servers are not indexable; c) Preventing source code of server-side executables and scripts from being viewed by a web browser; d) Ensuring that the source of HTML, JavaScript and other client-side scripting languages does not contain unnecessary information (e.g., comments and details of functions); and e) Using the POST method when submitting all sensitive form data. 	C
PS7.3	Recording Actions Public-facing web servers that support the web application must be configured to: <ul style="list-style-type: none"> a) Record actions performed (e.g., those associated with server-side executables and scripts); and b) Log security-related events generated by the website. 	D

#	Rule	Evaluation Method
PS7.4	<p>Web Application Vulnerabilities</p> <p>Application code used for web applications and application interfaces must be tested and remediated for, at a minimum, the following vulnerabilities:</p> <ul style="list-style-type: none"> a) Cross-site scripting (XSS); b) Improper access control; and c) Cross-site request forgery (CSRF). 	D
PS7.5	<p>Storing Electronic Health Information</p> <p>The web application must not store electronic health information or sensitive information in hidden form fields or unencrypted cookies.</p>	C
PS7.6	<p>Protecting Web Sessions</p> <p>Web application sessions must be protected by:</p> <ul style="list-style-type: none"> a) Ensuring session IDs cannot be easily predicted (e.g., using randomly generated session IDs); b) Configuring the security parameters in 'cookies' used to hold session information; c) Encrypting network traffic (e.g., TLS v1.2 or higher) between the: <ul style="list-style-type: none"> i. web browser and the web server; and ii. web server and the database; and d) Setting sessions to expire after: <ul style="list-style-type: none"> i. inactivity (HTTP timeout to a maximum of 15 minutes); and ii. a set length of time (absolute timeout to the minimal value possible depending on the context of the web application). 	C & D

#	Rule	Evaluation Method
PS7.7	<p>Web Application Firewall</p> <p>A web-application firewall or alternate technical solution configured to provide protection from known attacks must be used.</p> <p>Note(s):</p> <ol style="list-style-type: none"> 1. A web-application firewall is a firewall specialized to protect web servers from malicious traffic and blocks attempts to compromise the system. 2. It prevents targeted attacks that include application layer DoS attacks cross-site scripting, SQL injection, forceful browsing, cookie poisoning and invalid input. 	C
PS7.8	<p>HTTP Certificates</p> <p>If cryptographic controls are required for HTTP, an X.509 certificate must be used for performing server authentication.</p>	C
PS7.9	<p>HTTP Transport Layer</p> <p>For the HTTP Transport Layer, HTTPS must be used with TLS 1.2 or above. All lower version SSL must be disabled.</p>	C
PS7.10	<p>HTTP Encryption</p> <p>If cryptographic controls are required for HTTP, they must be implemented as follows:</p> <ol style="list-style-type: none"> a) HTTPS must use AES. b) The AES key length must not be less than 128 bits. c) Web servers supporting HTTPS must disable RC4. d) Perfect forward secrecy should be used where available. 	C

#	Rule	Evaluation Method
PS7.11	<p>SOAP Web Services</p> <p>SOAP Web services that require cryptographic controls must be compliant with WS-I Basic Security Profile 1.0 with the following provisions:</p> <ul style="list-style-type: none">a) Transport layer implementations must comply with one of the following two choices:<ul style="list-style-type: none">i. TLS implementations: TLS_RSA_WITH_AES_128_CBC_SHA;ii. SSL implementations: SSL_RSA_WITH_AES_128_CBC_SHA;b) Cryptographic modules implementing the above must be validated to FIPS 140-2.	C

3.0 Application Support

This section describes the information privacy and security rules that apply to all software organizations providing application support to interfaces with the ministry's HIE services.

3.1 Organizational Policy

Table 8 Organizational Policy Rules

#	Rule	Evaluation Method
PS8.1	<p>Governance</p> <p>Organizational cybersecurity roles and responsibilities for the entire workforce and third-party stakeholders (e.g., suppliers, customers, partners) must be established and documented.</p> <p>For the software organization providing application support, an individual in the organization is ultimately responsible for the privacy and security policies.</p>	C
PS8.2	<p>Policies and Procedures</p> <p>Privacy and security policies and procedures must be established (or adopted) and published, including policies and procedures related to secure storage, retention, transport and disposal of client data records; audit log reviewing; and user account maintenance that meet or exceed the contract/agreement privacy and security requirements with the Ministry.</p> <p>Note(s): Sources for developing policies and procedures may include (but are not limited to):</p> <ul style="list-style-type: none"> • ISO 27001 - Information Security Management Systems Requirements; • ISO 27002 - Code of Practice for Information Security Management; • ISO 27799:2008 - Information Security Management in Health; and • Canadian Standards Association's Model Code for the Protection of Personal Information (CAN-CSA-Q830-03). 	A
PS8.3	<p>Policies and Procedures Maintenance</p> <p>The policies and procedures must be regularly reviewed and updated as required, either at planned intervals and/or when significant changes occur.</p>	A

#	Rule	Evaluation Method
PS8.4	Review of Information Systems The organization must have a documented procedure for internally reviewing its information systems for conforming to the requirements of the privacy and security policies.	C

3.2 Staff and Contractors

Table 9 Staff and Contractors Rules

#	Rule	Evaluation Method
PS9.1	Confidentiality Agreements All personnel (employees and contractors) who access or support the application must sign a confidentiality agreement that: <ul style="list-style-type: none"> a) Specifies obligations and expectations including repercussions for inappropriately collecting, using, or disclosing personal information; and b) Are reviewed/renewed annually with the organization. 	A
PS9.2	Acceptable Use Agreements All personnel (employees and contractors) who access or support the application must sign an acceptable use agreement which defines user responsibilities for software, computer equipment, network, and internet use.	A
PS9.3	Privacy and Security Awareness Training All personnel (employees and contractors) who access or support the application must annually receive information privacy and security awareness training which includes the privacy and security requirements in this document.	A
PS9.4	Contract Privacy Protection Clause Contracts with third-party vendors that involve EHI must contain privacy protection obligations, which meet or exceed the contract/agreement privacy and security requirements with the Ministry.	A

3.3 Complaints and Incidents

Table 10 Complaints and Incidents Rules

#	Rule	Evaluation Method
PS10.1	<p>Information Incident Management</p> <p>Procedures must be established for managing suspected and actual information incidents to meet, at minimum, the requirements recommended by the Office of Information and Privacy Commissioner for British Columbia.</p> <p>Note(s):</p> <ol style="list-style-type: none"> 1. An information incident is when unwanted or unexpected events happen that threaten privacy or information security. 2. Information incidents are also called privacy breaches when they involve personal information about people, such as names, birthdates, social insurance numbers, or client file information. 3. A breach can include the loss or theft of personal health information or other unauthorized activities, including unauthorized access that may result in the loss of custody or control over personal health information. 4. Privacy Breaches: Tools and Resources by the Office of the Information Privacy Commissioner for British Columbia (www.oipc.bc.ca/guidance-documents/1428). 	A
PS10.2	<p>Information Incident Reporting to the Ministry</p> <p>Suspected or actual information incidents or breaches that involve electronic health information must be immediately reported to the ministry in accordance with the terms and conditions of applicable agreements.</p>	A
PS10.3	<p>Whistle-Blower Protection</p> <p>Personnel (employees and contractors) must be made aware of procedures for responding to suspected and actual privacy and security incidents and breaches, including "whistle-blower" protection measures.</p>	C

3.4 Technical Support

Table 11 Technical Support Rules

#	Rule	Evaluation Method
PS11.1	<p>Remote Access for Technical Support</p> <p>Remote access to the application host is only permitted when a service provider requires access to perform technical support services.</p> <p>The following controls must be in place for the remote technical support:</p> <ul style="list-style-type: none"> a) Secure remote access technologies such VPN, firewall rules, authentication, encryption (minimum AES-128 bit); b) Audit and monitoring processes during the remote access sessions; c) Activation of remote-access technologies by the point of service only when needed with immediate deactivation after use; d) Automatic disconnect of sessions after a specific period of inactivity; e) Approved and logged on a case by case basis by the point of service - if unsupervised access is provided, the reasons why this is necessary; f) Unique identifiable user IDs; g) Multi-factor authentication; h) Devices that meet minimum security configuration (e.g., up-to-date malware protection, latest systems and software patches installed, personal firewall); and i) Provided from a location within Canada, unless otherwise permitted in writing by the ministry in accordance with applicable laws. 	A
PS11.2	<p>Storing of Data Prohibited</p> <p>If providing remote technical support via remote-access technologies, the copy, move, and storage of data onto local hard drives and removable electronic media must be prohibited.</p>	A
PS11.3	<p>VPN Remote Support</p> <p>If providing remote technical support using a VPN for remote access, split tunneling must be disabled at the technical support agent's workstation while the technical support session is active.</p>	A

#	Rule	Evaluation Method
PS11.4	<p>Logging Technical Support/Administrative Activity</p> <p>Technical support/administrative activities, such as configuration changes, or other changes originating from a client request or routine administrative activity must be logged.</p> <p>The mechanism may be automated or may require manual processes.</p> <p>A record of the support activities must be retained for two years or as prescribed in regulation and include:</p> <ul style="list-style-type: none"> a) The technical support person's name and contact information; b) The name and contact information of: <ul style="list-style-type: none"> i. the person who authorized the access, and ii. each person whose name, password, code or other information was used to access the HIE system; c) The date and time of each access; and d) If unsupervised access was provided, the reasons why this was necessary, including details of the actions taken. 	A
PS11.5	<p>Administration of Remote Systems</p> <p>Command line administration of remote systems and devices must be done by employing SSH Version 2 or higher.</p> <p>The encryption algorithm used MUST be AES with a minimum key length of 256 bits.</p> <p>Mutual authentication MUST be used between user and server.</p>	A

3.5 POS Accounts and Systems Access

This section is for software providers administering user accounts either hosted locally or by an application service provider (ASP).

Table 12 POS Accounts and Systems Access Rules

#	Rule	Evaluation Method
PS12.1	<p>POS User Registration Process</p> <p>POS users (including privileged users) must be registered through a formal process which establishes the user's identity and the appropriateness of the access which they are to be granted to EHI.</p> <p>User IDs are only used by one user and are not reused once decommissioned.</p>	C
PS12.2	<p>Inactive POS User Accounts</p> <p>A user account inactive for 90 days or greater is considered dormant and must be disabled to prohibit login to the system.</p>	D
PS12.3	<p>New POS User Account Pending Activation</p> <p>A new user account not activated within 5 business days or greater from the day of the activation notice is considered dormant and must be disabled to prohibit login to the system.</p>	C
PS12.4	<p>Notify POS User for Significant Account Changes</p> <p>The POS user must be notified on any significant changes made to their user account (e.g., password change, access from IP address outside of Canada, or other security events) so that the owner can confirm the request came from them.</p>	C

#	Rule	Evaluation Method
PS12.5	<p>User Account Validation</p> <p>User account validation must be performed annually, working with customers to validate the active accounts at each customer POS.</p> <p>Confirm that:</p> <ul style="list-style-type: none"> a) Each account belongs to an individual who currently works at the POS; b) POS user IDs are not being shared and each user has a unique user ID; and c) Gather additional account information to support user authentication as required. 	C
PS12.6	<p>Password Management for POS Users</p> <p>The password used to access a HIE system must:</p> <ul style="list-style-type: none"> a) Be a minimum of eight characters; b) Contain characters from three of the following categories (Uppercase characters, Lowercase characters, Numerals, Non-alphanumeric keyboard symbols); and c) Be changed at a every 90 days or less, or as required by policy for the HIE system. 	C
PS12.7	<p>Transmission of Passwords</p> <p>Passwords/passphrases must be securely communicated and separate from the user ID when transmitted electronically.</p>	A

4.0 Application and Data Hosting Services

4.1 Application and Data Hosting Environment

This section describes the information privacy and security rules for all organizations providing application and/or data hosting services (i.e., systems hosted by an application service provider) which are used to interface with the ministry's HIE services.

An ASP provides network-based access to software services and involves:

- Remotely hosting a client's system, application and data on its secured computer servers;
- Providing client access through a web browser or thin client;
- Professionally managing the servers and other related technologies; and
- No POS client server hardware or software being required at the point of care.

Table 13 Application and Data Hosting Environment Rules

#	Rule	Evaluation Method
PS13.1	Physical and Environmental Protection Policy and procedures that address the purpose, scope, roles, responsibilities, and compliance for physical and environmental security including security perimeter and entry controls, working in secure areas, equipment security, cabling security, fire detection and suppression, room temperature controls, and flood/water hazard must be in place.	A

#	Rule	Evaluation Method
PS13.2	Secure Area Areas that house equipment (e.g., server rooms, network or telecommunications closets) must be protected against unauthorized access by using the following physical security measures: <ul style="list-style-type: none"> a) Strong physical security perimeter by using solid construction walls, alarmed fire doors, and armoured windows; b) Locks activated by keypads, swipe cards or equivalent; c) Intruder alarms; d) Security guards; and e) Recorded video surveillance. 	C
PS13.3	Physical Access Monitoring Physical access to the secure areas (and the systems within the secure areas) in the application hosting environment must be monitored. Records for approved personnel access and sign-in sheets for visitors must be maintained. Logs must be periodically reviewed, violations or suspicious activities investigated, and action is taken to address issues.	A
PS13.4	Protecting Equipment Equipment including data or software for supporting the application hosting environment must: <ul style="list-style-type: none"> a) Only be repaired or serviced by authorized personnel; and b) Not be removed or taken off premises without prior authorization by management. 	C
PS13.5	On-site Technical Support Services Personnel involved in on-site technical support must have their access logged, monitored, and escorted while in restricted access areas.	A

#	Rule	Evaluation Method
PS13.6	Environmental Controls Environmental controls must be provisioned and properly maintained, including (but not limited to): <ul style="list-style-type: none"> a) Uninterrupted power supply to facilitate an orderly shutdown process; b) Fire detection and suppression; c) Temperature and humidity controls; and d) Water damage detection and mitigation. 	C
PS13.7	Business Continuity and Disaster Recovery All servers with operationally critical data must have documented back-up, system and application restoration (including configurations), and data restoration procedures to support business continuity and disaster recovery planning.	A
PS13.8	Disaster Recovery Security Controls During disaster recovery, the backup application hosting environment must have the same security controls as the primary application hosting environment.	C
PS13.9	Information Systems Change Control Procedures for changes to operating procedures, information systems and components, and onboarding of new partner/supporting applications, must include: <ul style="list-style-type: none"> a) Explicit authorization from management accountable for Information Security; and b) Testing to ensure there is no adverse effect on operations or security. 	A

4.2 Auditing

Table 14 Auditing Rules

#	Rule	Evaluation Method
PS14.1	<p>Access Audit Program</p> <p>Audit and control procedures must be in place to monitor the activities for all support services and personnel within the application hosting environment.</p> <p>These procedures describe monitoring methods and escalation steps, when suspicious activity is discovered.</p> <p>The access audit program may:</p> <ul style="list-style-type: none"> a) Integrate into existing random audit processes; b) Integrate into existing proactive audit reporting; or c) Be established as a new process. <p>Minimum review requirements must be set, including regular review of standard and routine reports, regular random audits/spot checks, and proactive measures.</p> <p>There must be a designated individual(s) in the organization with the responsibility for access audit.</p> <p>The responsibility must include providing evidence to auditors and oversight authorities that the reviews have been completed.</p>	A
PS14.2	<p>Reporting to Management</p> <p>Audit logs and exception reports produced from audit logs must be regularly reviewed and the findings communicated to and signed by management, including:</p> <ul style="list-style-type: none"> a) Any unusual patterns or anomalies; and b) Potential security weaknesses or breaches. 	A
PS14.3	<p>Integrity of Log Files</p> <p>Audit logs (including any backup copies) must be secured so that the information contained within them cannot be altered.</p>	C

#	Rule	Evaluation Method
PS14.4	Audit Log Retention Audit logs must be retained for a minimum of two years or as prescribed in regulation.	C
PS14.5	Audit Log Restrictions Access to the audit logs and audit tools must be restricted to authorized personnel to prevent misuse or compromise.	C
PS14.6	Audit Trails A process for linking all access to system components (especially access done with administrative privileges such as root) to each individual user must be established.	C
PS14.7	Audit Events Automated audit trails must be implemented for all system components to reconstruct the following events: <ul style="list-style-type: none"> a) All individual accesses to application hosting environment data; b) All actions taken by any individual with root or administrative privileges; c) Access to all audit trails; d) Invalid logical access attempts; e) Use of identification and authentication mechanisms; f) Initialization of the audit logs; and g) Creation and deletion of system-level objects. 	C

#	Rule	Evaluation Method
PS14.8	<p>Audit Record Fields</p> <p>Audit trail entries must record at least the following for all system components for each event:</p> <ul style="list-style-type: none">a) User identification;b) Type of event;c) Date and time;d) Success or failure indication;e) Origin of event; andf) Type, identity or name of affected data, system component, or resource.	C

4.3 Accounts and Systems Access

Table 15 Accounts and Systems Access Rules

#	Rule	Evaluation Method
PS15.1	Privileged Account Lock Out After reaching an account lockout threshold (maximum of six consecutive failed logon attempts) for a privileged account, the logon process must lock the account and require administrator intervention.	A
PS15.2	Transmission of Passwords Passwords/passphrases must be securely communicated and separate from the user ID when transmitted electronically.	A

4.4 Hardware and Peripherals

Table 16 Hardware and Peripherals Rules

#	Rule	Evaluation Method
PS16.1	Restricting Access to Unattended Management Consoles Screens on unattended management consoles must be cleared after a set period of inactivity (maximum of 15 minutes) and requires signing on again with a password before restoring screens.	C
PS16.2	Malware Protection Anti-virus software must be deployed on all systems commonly affected by malicious software (particularly servers in the DMZ). Anti-virus mechanisms must be current, actively running, and generating audit logs.	C
PS16.3	Computing Devices Connecting to the Internet Computing devices used for the management of application hosting environment servers must not have direct connectivity to the internet.	C
PS16.4	Limit Use of Mobile and Portable Storage Devices Mobile and portable storage devices (e.g., CDs, external hard drives, USB flash drives, wireless devices) that may be used to copy or remove EHI must not be permitted within the application hosting environment.	C
PS16.5	Secure Disposal of Equipment All Personal Health Information must be permanently removed from computer equipment prior to disposal of the equipment.	C

#	Rule	Evaluation Method
PS16.6	<p>Asset Inventory</p> <p>An inventory of all assets used in the provision of the hosting service must be created and updated as required.</p> <p>For each asset, the inventory:</p> <ul style="list-style-type: none"> a) Assigns a classification indicating the sensitivity of the asset; b) Assigns responsibility to a specific role in the organization; c) Identifies the type of the asset; d) Identifies the location of the asset; and e) Describes backup and recovery provisions. <p>Note(s): An asset may include:</p> <ul style="list-style-type: none"> • All servers involved in the hosting of the service; • Software code that must be protected from modification; • EHI and other hosted information assets. 	C

4.5 Network

Table 17 Network Rules

#	Rule	Evaluation Method
PS17.1	<p>Remote Access</p> <p>Remote access to application hosting environment servers is only permitted when a service provider requires access to perform technical support services.</p> <p>The following controls must be in place for the remote technical support:</p> <ul style="list-style-type: none"> a) Secure remote access technologies such VPN, firewall rules, authentication, encryption (minimum AES-128 bit); b) Audit and monitoring processes during the remote access sessions; c) Activation of remote-access technologies only when needed with immediate deactivation after use; d) Automatic disconnect of sessions after a specific period of inactivity; e) Approved and logged on a case by case basis; f) Unique identifiable user IDs; g) Multi-factor authentication; h) Devices that meet minimum security configuration (e.g., up-to-date malware protection, latest systems and software patches installed, personal firewall); and i) Provided from a location within Canada, unless otherwise permitted in writing by the ministry in accordance with applicable laws. 	C
PS17.2	<p>Limiting Wireless Networks</p> <p>Wireless networks must not be used within the application hosting environment.</p>	C

#	Rule	Evaluation Method
PS17.3	<p>Firewall and Router Configuration</p> <p>Firewall and router configuration standards must be established and include the following:</p> <ul style="list-style-type: none"> a) Formal process for approving and testing all network connections and changes to the firewall and router configurations; b) Current network diagram with all connections to application hosting environment data; c) Requirements for a firewall at each Internet connection and between any demilitarized zone (DMZ) and the internal network zone; d) Description of groups, roles, and responsibilities for logical management of network components; e) Documentation and business justification for use of all services, protocols, and ports allowed, including documentation of security features implemented for those protocols considered to be insecure (e.g., FTP, Telnet, POP3, IMAP, and SNMP); and f) Requirement to review firewall and router rule sets at least every six months. 	A
PS17.4	<p>Firewall and Router Controls</p> <p>Firewall and router configurations must restrict connections between untrusted networks and any system components in the application hosting environment.</p> <ul style="list-style-type: none"> a) Limit inbound and outbound traffic to that which is necessary for the application hosting environment; and b) Secure and synchronize router configuration files. <p>Note(s): An “untrusted network” is any network that is external to the application hosting environment under review, and/or which is out of the ASP's ability to control or manage.</p>	A
PS17.5	<p>Restrict Direct Public Access</p> <p>Direct public access between the internet and any system component in the application hosting environment must be prohibited.</p> <p>The following must be implemented:</p>	A

#	Rule	Evaluation Method
	<p>a) A DMZ to limit inbound traffic to only system components that provide authorized publicly accessible services, protocols, and ports;</p> <p>b) Limit inbound internet traffic to IP addresses within the DMZ;</p> <p>c) Do not allow any direct connections inbound or outbound for traffic between the internet and the application hosting environment;</p> <p>d) Connections to the application hosting environment utilizing the internet must be protected using a reverse proxy in the DMZ;</p> <p>e) No “split-tunneling” of any secure connection between the application hosting environment and client;</p> <p>f) Do not allow internal addresses to pass from the internet into the DMZ;</p> <p>g) Do not allow unauthorized outbound traffic from the application hosting environment to the Internet;</p> <p>h) Implement stateful inspection, also known as dynamic packet filtering (i.e., only established connections are allowed into the network);</p> <p>i) Place system components that store application hosting environment data (e.g., a database) in an internal network zone, segregated from the DMZ and other untrusted networks; and</p> <p>j) Do not disclose private IP addresses and routing information to unauthorized parties.</p> <p>Note(s): Methods to obscure IP addressing may include (but are not limited to):</p> <ul style="list-style-type: none"> • Network Address Translation (NAT); • Placing servers containing application hosting environment data behind proxy servers/firewalls or content caches; • Removal or filtering of route advertisements for private networks that employ registered addressing; and • Internal use of RFC1918 address space instead of registered addresses. 	

#	Rule	Evaluation Method
PS17.6	Restricting Access to Network Devices Network devices, including network diagnostic ports and services, must be restricted to authorized network staff using access controls that support individual accountability, and be protected from unauthorized access.	A
PS17.7	Network and Host System Protection Vendor-supplied defaults must be changed before installing a network device or host system on the network, including but not limited to passwords, simple network management protocol (SNMP) community strings and elimination of unnecessary accounts.	A
PS17.8	Network and Host System Configuration Configuration standards must be developed for all network and host system components. These standards must address all known security vulnerabilities and be consistent with industry-accepted system hardening standards. Note(s): Sources of industry-accepted system hardening standards may include, but are not limited to: <ul style="list-style-type: none"> • Center for Internet Security (CIS); • International Organization for Standardization (ISO); • SysAdmin Audit Network Security (SANS) Institute; and • National Institute of Standards Technology (NIST). 	A
PS17.9	Host System Primary Function There must be only one primary function per server (e.g., web servers, database servers, and DNS must be implemented on separate servers). If virtualization technologies are in use, implement only one primary function per virtual system component. Note(s): This is to prevent functions that require different security levels from co-existing on the same server.	A

#	Rule	Evaluation Method
PS17.10	<p>Limit Host System Services</p> <p>Host system services must be limited to only necessary and secure services, protocols, daemons as required for the function of the system.</p> <p>The following steps must be completed to limit host system services:</p> <ul style="list-style-type: none"> a) Remove all unnecessary functionality (e.g., scripts, drivers, features, subsystems, file systems, and unnecessary web servers); b) Implement security features (e.g., SSH, S-FTP, TLS, or IPSec VPN) for any required services, protocols or daemons that are considered to be insecure (e.g., NetBIOS, file-sharing, Telnet, FTP); and c) Configure system security parameters and set according to configuration standards to prevent misuse. 	A
PS17.11	<p>Segregate Client Organization</p> <p>Each client organization hosted within the application hosting environment must be segregated by:</p> <ul style="list-style-type: none"> a) Ensuring that each client organization only runs processes that have access to that client's data environment; b) Restricting each client organization's access and privileges to its own data environment only; c) Ensuring that logging and audit trails are enabled and unique to each client's data environment; and d) Enabling processes to provide for timely forensic investigation in the event of a compromise to any client's data. 	A
PS17.12	<p>System Utility Program Controls</p> <p>The use of system utility programs (which may be used to override system and application controls) must be restricted and tightly controlled (i.e., utilities are managed/monitored on use, and access based on role and segregation of duty).</p>	A

#	Rule	Evaluation Method
PS17.13	<p>Encrypt Non-Console Communications</p> <p>Strong cryptography must be used to encrypt all non-console administrative (network) access.</p> <p>Technologies (e.g., SSH v2.0 or higher with AES-256, VPN, or TLS v1.2 or higher with AES-128) for web-based management and other non-console administrative access must be used.</p>	C
PS17.14	<p>Intrusion Prevention and Detection</p> <p>Intrusion-detection systems, and/or intrusion-prevention systems must be used to monitor all traffic at the perimeter of the application hosting environment as well as at critical points inside of the application hosting environment, and alert personnel to suspected compromises.</p> <p>All intrusion-detection and prevention engines, baselines, and signatures must be kept up-to-date.</p>	C
PS17.15	<p>Monitoring for Cybersecurity Events</p> <p>The network must be monitored to detect potential cybersecurity events.</p> <p>Detected events are analyzed to understand attack targets and methods.</p> <p>The logs and security events for all solution components, including servers and system components that perform security functions (e.g., firewalls, intrusion-detection systems/intrusion-prevention systems and authentication servers) must be reviewed daily to identify anomalies or suspicious activity.</p> <p>Note(s): Logs and security events should be written to a secure, centralized, internal log server or media device such as a Security Information and Event Management (SIEM) tool.</p>	C
PS17.16	<p>Backup Files Stored Off-site</p> <p>Backup files stored off-site must be encrypted to AES-256 or stronger.</p> <p>The off-site storage location's security must be reviewed annually.</p>	C

#	Rule	Evaluation Method
PS17.17	<p>Network Time</p> <p>All system components that support the application hosting environment must use time-synchronization technology (NTP) to synchronize system clocks.</p> <p>The following must be implemented for acquiring, distributing, and storing time:</p> <ul style="list-style-type: none">a) Time data is protected; andb) Time settings are received from industry-accepted time sources such as the National Institute of Standards and Technology (NIST).	A

5.0 Cloud Services

5.1 Cloud Privacy and Security

This section describes the information privacy and security rules that apply to all organizations utilizing cloud services when developing interfaces to health information exchange (HIE) services offered by the Ministry of Health (the “ministry”).

Table 18 Cloud Privacy and Security Rules

#	Rule	Evaluation Method
PS18.1	Cloud Security Frameworks The cloud service must be certified, accredited, and continually maintain one or more cloud security frameworks (i.e., ISO 27017, CSA CCM or NIST 800-53). The BC Provincial Government retains the right to audit components.	C
PS18.2	Security Investigations and Legal Discovery The Cloud Service Provider must enable and provide support/assistance in government security investigations and legal discovery.	A
PS18.3	Cloud Services Security Schedule A contract must be in place with the Cloud Security Provider that includes a schedule covering all the security requirements in the Province of BC Cloud Security Schedule.	A