The intelligent cancer data delivery system for hospitals, laboratories and cancer registries
E-Path Reporter

What is E-Path Reporter?
Cancer is a reportable disease throughout much of the world, and providing information on incident cases to central cancer registries is generally a legislated requirement.
E-Path Reporter is an electronic cancer data delivery system that completely automates the casefinding and reporting process.
E-Path Reporter uses artificial intelligence technology (AI) to identify reportable diagnoses of cancer and a secure messaging engine to deliver selected reports electronically to cancer registries—in near real time—with virtually no manual labour involved.

Benefits of E-Path Reporter
Hospitals/laboratories benefit from:
- Improved compliance with cancer reporting requirements
- Significant savings in time and effort
- Enhanced patient privacy
- Accurate audits of disclosed information
Cancer registries benefit from:
- More timely receipt of incident cases (within hours or days of diagnosis)
- More complete reporting (by as much as 20%)
- Standardization of data from diverse reporting sites
- Significant labour savings

The AI advantage
What gives E-Path Reporter a distinct advantage is its AI Engine technology. The AI uses expert algorithms to achieve very high sensitivities and specificities in cancer casefinding—more accurate and consistent than human interpretation. In practice, with E-Path Reporter, cancer registries can expect an increase in incident cancer reporting by as much as 20%.
The currently available AI Engines support the interpretation of anatomic pathology reports and diagnostic imaging reports of the central nervous system. Processing anatomic pathology reports finds all histologically confirmed tumors. Processing imaging reports finds neoplasms of the central nervous system that are not commonly biopsied and often under-reported.

Why should your laboratory use E-Path Reporter?
- Secure
E-Path Reporter complies with U.S. HIPAA rules and uses state of the art encryption methods for data transmission. E-Path Reporter also enhances privacy by eliminating the need to review non-cancer reports.
- Complete
E-Path Reporter is more accurate at identifying reportable cancers than human review. Its fault tolerant design prevents data loss and audit trails are maintained for all transactions.
- Efficient
E-Path Reporter is a fully automated process and requires minimal human intervention.
- Consistent
E-Path Reporter standardizes report structure and content, regardless of the reporting source.
- Research
E-Path Reporter helps researchers find patient and case information quickly and easily.
- Clinical Trials
E-Path Reporter is the data source for AIM’s Rapid Case Ascertainment (RCA) software, which automatically matches patients with research studies, increasing accrual rates and enrollment.

E-Path will have a significant impact on my department’s manpower, my ability to plan and balance resources, do more studies and move the casefinding abstracting date backward. Now that we are spending less time looking for patient data, we are able to focus on how to make registry data more sophisticated.
- Dr. Juanita Pratt
Manager Cancer Registry Operations and Clinical Documentation & Treatment Records
UC Davis Comprehensive Cancer Center—Davis, California

Efficient electronic cancer reporting is critical to patient care, to clinical trial selection, to chemotherapy of neoplasms ... E-Path has radically transformed our processes, allowing us to better serve patients and clinical customers in surgery and oncology.
- Dr. Mark Tuthill
Pathology Informatics Division
Henry Ford Health System—Detroit, Michigan

We are very excited about E-Path. This is the best casefinding our CTR’s have ever seen. I feel assured we will have fewer missed cases, eliminate reporting errors and reduce the incidence of false-positive reports that need to be reviewed.
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E-Path Reporter Software

E-Path Reporter is comprised of the following software components:

1. TransMed, an integration and messaging engine
2. AIM’s unique AI Engines for interpretation of pathology and diagnostic imaging reports
3. The E-Path Monitoring Console, a user application for monitoring and reviewing the information being received

An example installation is shown in figure 1. All software is for Microsoft® Windows™ operating systems (Windows XP, 2003, 2008 and Windows 7).

TransMed (Integration/Messaging)

TransMed allows E-Path Reporter to be connected to virtually any source of data: file systems, databases or network feeds. TransMed extracts and transforms input data to standard formats (e.g. HL7 or CDA*), translates data values to common vocabularies, performs casefinding (filtering) using the installed AI Engines and sends selected reports to cancer registries electronically and securely.

Duplicate Checking

Some laboratory interfaces broadcast messages repetitively. TransMed can detect and filter out duplicate messages.

Demographic Data Enrichment

In cases where laboratory systems contain minimal patient and provider demographics, TransMed can enrich reports with demographic data from ADT feeds before sending the reports to the cancer registry.

Addendum Report Forwarding

In some instances, a tumor pathology report may be followed by another pathology report (on the same patient) with additional findings related to the original diagnosis. However, the addendum itself might not contain the original morphology or not the pathology findings represent a reportable cancer, according to the prevailing cancer reporting rules. E-Path Reporter can also operate with more than one set of selection rules if different sets of reports are required for different purposes or destinations.

AI Engine — Pathology (Casefinding)

Identifies topographic and morphological concepts in pathology reports and codes these to ICD-O-3® nomenclature. Based on the codes, the AI decides whether or not the pathology findings represent a reportable cancer, according to the prevailing cancer reporting rules.

E-Path Reporter is supplied with standard SEER® case selection rules, including those dealing with ambiguous terminology. However, the rules can be modified and extended to accommodate reporting requirements in your region and can be updated over time as practices change. E-Path Reporter can also operate with more than one set of selection rules if different sets of reports are required for different purposes or destinations.

AI Engine — CNS Imaging (Casefinding)

Analyzes the texts of reports of CT scans of the head and MRIs of the brain and categorizes reports as follows:

1. A primary CNS neoplasm not known to be previously diagnosed
2. A neoplasm previously diagnosed (history of)
3. A metastatic lesion

4. Other previously diagnosed cancer
5. Negative for findings of cancer

Based on these categories, the AI decides whether or not the findings represent a reportable cancer, according to the prevailing cancer reporting rules.

E-Path Monitoring Console (Document Review)

The E-Path Monitoring Console allows registrars to review pathology reports that have been received through E-Path Reporter at the cancer registry. While the review of documents is not strictly necessary (the data can be passed to cancer registry systems directly), the E-Path Monitoring Console adds value by:

- Building a searchable database of cancer documents
- Automatically linking documents to patients
- Reviewing documents on screen
- Assisting coding of primary site and morphology
- Mapping data elements to the NAACCR® standard record format
- Providing standardized data exports to downstream systems, including cancer registry systems and databases.

A new version, capable of processing any clinical documents, with richer features and enhanced security controls, is scheduled for release in 2014.

Support and upgrades

E-Path Reporter software is fully supported by Artificial Intelligence in Medicine Inc. The AI Engines are routinely upgraded as new terminology and new concepts enter into the domain, and TransMed is routinely updated to keep pace with advances in security, networking, and health information exchange technologies and standards.

System requirements

TransMed & AI Engines

Microsoft Windows XP, 2003, 2008, 2008 R2 or Windows 7 (32 or 64 bit), 2 GB RAM

2 GB disk space for the software

Approx. 1 GB disk space per annum for message archiving

Virtualized environments are supported

E-Path Monitoring Console

Microsoft Windows XP, 2003, 2008, 2008 R2 or Windows 7 (32 or 64 bit), 1 GB RAM

Approx. 1 GB disk space per annum for data storage

Measuring performance

E-Path’s high level of effectiveness is due to its casefinding accuracy. The accuracy of casefinding is measured upon implementation and confirmed periodically thereafter. Casefinding accuracy is measured in terms of sensitivity and specificity. Sensitivity is a measure of the ability to correctly identify reportable cases. Specificity is a measure of the ability to correctly exclude non-reportable cases.

These metrics are assessed in the context of a defined set of cancer reporting rules, usually prescribed by public health agencies in a given jurisdiction.

Upon implementation, performance is measured by processing a statistically valid sampling of reports through E-Path Reporter to determine the selectability of each reportable cancer case.

Supporting metrics include:

- Selectability
- Specificity
- Sensitivity
- Positive Predictive Value (PPV)
- Negative Predictive Value (NPV)
- Casefinding accuracy

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report. All of the reports in the sample set are also reviewed manually to establish a reference selectability. The manual review can be performed either by the central cancer registry or the hospital cancer registry. Comparison of the system-generated results with the reference results allows sensitivity and specificity to be calculated.

E-Path Reporter routinely achieves a sensitivity greater than 99% and a specificity greater than 98%. However, it is sometimes necessary to tune the AI Engines to account for local variations in medical terminology, reporting style, use of non-standard abbreviations, ambiguous expressions and so on.

To an extent, sensitivity and specificity are inversely related. And, while it is important that both be high, sensitivity is usually favored to ensure that very few reportable cases are missed by the system. Thus, the number of false negative reports is kept to a minimum. False positive results are less consequential in that they will be detected as reports are reviewed for registration.

Implementation steps

The implementation of E-Path Reporter follows a prescribed sequence of steps as described below. During implementation, AIM’s integration team will work with your IT department to install the software, configure the interfaces to your laboratory systems and test connections and message transmissions. Once the system is operational, AIM personnel will work with you to benchmark performance, provide training and put the system into production.

Step 1: Assessment

AIM’s integration team works with your IT department to assess the best method of interfacing with your laboratory systems. At this time, AIM will require sample data outputs from the laboratory system or a network interface (e.g. HL7).

Step 2: Software installation

AIM delivers the software components on disc or by file transfer to your IT department for installation. To make things easier, AIM’s integration team can work by remote access to help you install and configure the software.

Step 3: Interface configuration and testing

AIM’s integration team configures a TransMed interface protocol to suit your particular laboratory system, database – or available network feeds – and source data formats. The interface protocol is deployed and data transmissions are then tested and verified.

Step 4: Benchmarking performance (QC Study)

AIM’s integration team works with you to measure the specificity and sensitivity of casefinding by processing a sample of reports through the system (see section “Measuring Performance” for details). AIM prepares a QC Study Report and the results are reviewed with your team in an online meeting.

Step 5: User Training

AIM provides online training in the use of the E-Path Monitoring Console with your designated staff, and helps you to integrate the data flow with your local cancer registry system (if applicable).

Step 6: Production operations

After completing training and verifying casefinding performance, production operations begin. A typical implementation requires approximately three person days of the client’s IT resources and an additional person day for performance benchmarking and training.

About AIM

Artificial Intelligence In Medicine Inc. (AIM) is a software engineering firm that designs, develops and deploys information management solutions, focusing on disease surveillance, prevention and research.

We specialize in the application of artificial intelligence technology (AI) to automate workflows, improve the efficiency of data processing and enhance the utility and quality of data in healthcare applications.

We believe that information technology can improve human health and the quality of life. Our philosophy is that innovative and intelligent solutions can improve medical research, disease prevention, healthcare service delivery and, ultimately, patient care.

Our range of customers includes government agencies, research organizations, disease-specific registries, hospitals, laboratories and individual researchers across the U.S., Canada and Australia.

Frequently Asked Questions

Q: Can E-Path connect to my registry system?
   A: Yes. E-Path will connect directly to essentially all conventional registry systems.

Q: How secure is the system?
   A: The TransMed integration/messaging software supports strong encryption and authentication methods to secure data in transit, including a self-managed public/private key exchange mechanism or the use of third-party security certificates. Independent tests have verified that the security measures comply with the U.S. HIPPA rules. However, since the system processes patient identified health information, it must be installed in a secure computing infrastructure.

Q: Does it work with synoptic reports?
   A: Yes. E-Path Reporter can transform table formatted synoptic reports in source data into NAACCR compliant HL7 message segments and can analyze the content of synoptic reports.

Q: My laboratory system does not have HL7 capability, can I still use E-Path Reporter?
   A: Yes. E-Path Reporter uses natural language processing (NLP) to interpret the content of reports. The AI Engines that perform content coding and report selection contain “lexicons” of thousands of terms, expressions, synonyms and other semantic information about the target domain (e.g. pathology). The AI Engines also contain heuristic rules for parsing structures, such as paragraphs, tables, lists and so on. This helps to extract concepts, identify relationships between concepts and determine the sense of concept expression (positive or negative). For each report analyzed, the AI Engine produces an array of standard concepts contained in the report. The AI Engine then compares these concepts to its casefinding rules and determines whether or not a report contains reportable findings or not.

Q: What happens if the Internet connection is down?
   A: E-Path buffers transmissions and resends them when the problem is corrected.

Q: Does my laboratory system need to be modified to connect to E-Path?
   A: No. You only need to have the system set aside copies of reports as they are released for reporting.

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Our engineers and technicians understand the medical environment, its paradigms, processes and needs. AIM provides comprehensive information technology services to the healthcare industry to meet the special requirements of clinical and research systems.

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