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ELECTRONIC HEALTH RECORDS - CURRENT STATE OF ADOPTION IN LIFE UNDERWRITING

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Introduction

In the June 2023 edition of *ON THE RISK*, the authors explored the evolution of health care data sources and types (e.g., prescription information [Rx report], medical claims codes, medical billing codes, Attending Physician Statements [APS]) currently used in underwriting workflows at carriers and reinsurers. In December 2023, these authors partnered with ACORD to underscore the importance of data standards and the activities underway to define the data standards for medical records used in life underwriting. Our previous articles also showcased opportunities to use Electronic Health Records (EHR), offering a compare and contrast between EHR and the traditional APS. We noted that data derived from EHRs is effectively the same as data found in APS outputs because it is inputted at the point of care by the attending physician. However, the data's presentation may appear different because of individualized stylesheets deployed by different EHR platforms to make the data readable. Because of this variability in data presentation, a carrier's use and an underwriter's approach to the reading and interpreting key clinical concepts need to pivot, and workflows may need to be optimized to maximize value.

EHR data is ubiquitous, and its ubiquity is only going to increase with evolving legislation toward better patient access and seamless interoperability across all data users and providers in the health care ecosystem. Moreover, data volumes in health care are exploding with new diagnostic and treatment pathways and their varying outcomes. It is critical to have an industry strategy for seamless integration of this changing and increasing data asset into

Executive Summary *This is the third article in a four-article series addressing Electronic Health Records (EHR) and their use in the life insurance industry. There are subtle differences in the types of EHR, and those differences need to be understood so the use of these data sources can be optimized to reduce cost and improve decision-making. EHR provides valuable structured data that can trigger rules and enable automated decisioning. It also includes a plethora of unstructured data. Opportunities exist to evaluate the unstructured data utilizing Artificial Intelligence (AI), Natural Language Processing (NLP) and Machine Learning (ML) to convert the text to structured data that can be interpreted more effectively by a decision engine or summarized and referred to an underwriter. These new data sources and the enabling technology will not by themselves assure a successful outcome. Change management is critically important for the successful evolution of this industry.*

underwriting processes. This strategy is premised on understanding the similarities and differences in data presentation and adoption of change management within organizations to harness these nuances. After all, innovation lies in the adoption and optimization of novel technologies by end users, not their advent.

This article will address:
- Traditionally implemented workflows.
- Human digitization of medical records.
- The deployment of Artificial Intelligence (AI) and Machine Learning (ML).

- The revolutionary possibilities from a healthy balance of EHR structured data and unstructured data abstracted from narrative text.

The Current State of Clinical Data in the Life Insurance Industry

Since the COVID-19 pandemic, EHR exploration, adoption and use within the life insurance industry have increased substantially. COVID's challenge on taxed hospitals and providers intensified the need to access clinical encounter data rather quickly and seamlessly than to print static documents. This shift has taken root as indicated by a recent poll that found significant industry interest (Table 1).

Table 1. The Life Insurance Industry's Use of EHR.

Is your company using electronic health records today?	
76.7%	Piloting/testing
13.7%	Considering
9.5%	Not using

Poll data culled during the Future of Underwriting at the 2023 Association of Home Office Underwriting meeting.

There is current widespread industry use of Rx reports and medical claims data. The sources for this robust and rich structured data are RxNorm codes for medications and ICD9/ICD10 codes for diagnoses. These data sources are the foundational triggers for rules (red/yellow/green or reject/refer to underwriter/approve), which have become pervasive in our industry's desire to automate. In addition to homegrown rules, many of the data providers furnishing this data interpret and analyze the reports with predictive models to yield a numeric risk score capable of being entered into the decisioning process of underwriting engines.

These data sets represent the "what" of health care: the patient's diagnoses and medications used to generate decisions. However, they lack the "why." For instance, why there was a cancer diagnosis or why a diabetic medication has been in constant flux over the last 2 years when it had been stable for 3 years prior? The "why" is critical to decision-making.

When evaluating the information, there are some pitfalls to avoid. Many of the data sources can be false positives, false negatives, or contain contradictions that require critical thinking and judgement to resolve. For example, medical claims codes are used for billing and reimbursement in the health care system. Claims can sometimes be over-coded to ensure the medical provider gets paid. If a medical facility performs a colonoscopy, it may provide a claim code for gastrointestinal (GI) bleed to ensure reimbursement.

Likewise, an Rx report may contain "off label" medications or medications traditionally effective for treating mild acute conditions that may be prescribed for a patient in treating more severe chronic conditions. For example, azithromycin can be used to treat simple sore throats or as prophylaxis against opportunistic infections in the immunosuppressed. The problem of GI bleed may trigger a "Refer to Underwriter" action that requires resolution by an underwriter; however, the specific reason for the medication may not be captured if possible permutations are not well vetted.

Despite widespread experience using the structured data sources we just described, for the most part, underwriters review encounter level data from provider offices or inpatient settings (even though it's a "print" from an Electronic Medical Record (EMR) in its native PDF format). In our June article, we noted that an APS is no more than a style sheet printout of the EMR data inputted into fields by the provider and presented in a way that can be easily read by a user not familiar with digital formats like XML or JSON. With the industry's exploration of EHR data and intent to drive standardized outputs regardless of data source, many industry EHR data vendors have created their own style sheet so that an underwriter's view of Epic and Cerner data, for example, look the same.

These encounter level style sheets are then together into a longitudinal flow based on the date of service. Each encounter has the same headers (e.g., demographic information, problems and medications.) One of the most common condemnations of EHRs by the underwriting community is that they contain significant redundancies. The redundancies are caused by the style sheets used by the EHRs to generate readable data for their primary audience: the clinicians providing care to their patients. The patient's chronic problems are aggregated in a summary list and pulled to the front of each encounter document. This creates a repetitive list of past problems included for each provider visit.

Some data providers have developed user-friendly interfaces to make data presentation more dynamic. Tables of contents and even hot links to different reference points within the document are some of the innovations designed to eliminate redundancies. However, some carrier legacy imaging and workflow systems may not enable the dynamic document enhancements and present the document as a static image.

EHRs have several advantages over traditional APSs. APSs are generally obtained from one physician or one clinic, whereas EHRs typically cover the entire

regional health system. This enables the carrier to get all the records from all physicians seen in that health care system at a cost that is generally fixed. It does not include a per page fee as typically seen with APSs. EHRs are effective at identifying specialists that may not have been included on the Part Two Medical Disclosures.

Despite EHR advantages and efficiencies, traditional underwriting is still very much accomplished by reading a plethora of information in a static PDF rendering of clinical charts. Even patients with few visits and impairments can present to underwriting with double- or even triple-digit page counts. In best-case scenarios, underwriters read these narrative PDFs in chronological order from the most remote patient encounter to the most recent, highlighting and annotating those pieces of clinical data critical to risk selection and documenting them in an underwriting workbench so that a decision can be made.

When medical consultation is necessary, some organizations request their underwriters to identify page numbers of the medical information in question to minimize the medical professional's "touch" of the entire document. Some organizations require that a medical director touch the entire document and attest to doing so. These multiple reviews have protective value, but sometimes the cost may exceed the benefit, especially when two (and sometimes more) critical thinkers (an underwriter and a medical director) are required to review an entire 500-page PDF on a small face amount case that is trending toward a decline or high substandard rating, which likely won't get placed.

Moreover, increasing touches raise the possibility of bias:
1. *Confirmation bias*, the tendency to seek out information that supports a held belief.
2. *In-group bias*, the tendency to affirm previous decisions.
3. *Information bias*, the superfluous amassing of information to aid in decision-making.
4. *Selection bias*, the tendency to notice things when we have seen an untoward outcome in a different setting.
5. *Availability bias*, the tendency to use information that fits within our acumen or recall.

Lastly, there are other concerns. Humans, by their nature, are inconsistent. The more a story is told, the more the truths of that story begin to decay, or the so-called "telephone game phenomenon." Also, an underwriter, mentally weary from a week of analyzing millions of data points from reading a thousand or more pages of documents daily, may be prone to

making a different offer on a Friday afternoon than on a Monday morning.

Outsource Summary of APS Reviews
Many carriers are using APS summary services to review their medical records. Some vendors send cases offshore for review by staff in other countries. Offshore staff may or may not be seasoned or medically trained. The output is a summary format suitable for a home office underwriter to review and feed directly into the carrier's underwriting system.

In addition to the previously described bias and the "telephone game," another disadvantage of these services is review can take days to be summarized and returned. The process, just like home office underwriting, is not very scalable, and the quality of the work is dependent on the experience of the staff.

APS offshore may, at times, accentuate the human touch challenges we have noted. The authors have seen complex 20-page neuropsychological evaluations reduced to "see page xxx-yyy for neuropsychological evaluation," because of the inherent complexity of interpreting the myriad of tests in the battery of tests, the narrative description of the symptoms, and the response to treatment.

Additionally, documentation in other countries is vastly different. In a medical delivery system where reimbursement, medicolegal protection, patient satisfaction and social factors adulterate rationales for documentation, even the most clinically savvy professionals offshore are challenged to read between the lines in the same way as an experienced US-based underwriter or medical director.

These US-based nuances can present important clues. For instance, not every coded diabetic truly has diabetes, but documenting it as such allows for diabetic testing to be reimbursed. There is risk to documenting suspected alcohol abuse, medication diversion or malingering for fear of patient disengagement or medicolegal consequence. Good underwriters and medical directors can identify documentation critical to decision making that reflects the care delivery model in the country where underwritten.

The same can be applied to a US-based underwriter determining risk in a different market – understanding the patient's psyche, the role of medical professionals, and social aspects influencing care are critical to interpreting the facts presented and making an optimal underwriting decision. While there is a learning curve and competency improves with time, there is no substitute for having lived in, received or provided care in the market in question.

Outsource Summary of APS Using Artificial Intelligence and Machine Learning

Many carriers recognizing the challenges with human interpretation by internal and outsourced resources are turning to the rapidly evolving Artificial Intelligence (AI) and Machine Learning (ML) technologies. Additionally, many carriers and reinsurers have embraced technologies such as Optical Character Recognition (OCR) and Natural Language Processing (NLP).

New vendors are entering the space armed with the competency to use OCR to convert the PDF image of APSs to text that can be fed into an NLP engine and interpreted by AI. Some vendors append their AI-found clinical concepts (i.e., underwriting risk factors) to medical ontologies like SNOMED, ICD-10 and Rx-Norm; they display their results with a confidence level when a complete set of breadcrumbs is not readily available. These vendors deterministically and convincingly stand behind the identified underwriting risk factors.

The output is a summarized APS as a narrative that can be easily read by an underwriter like a traditional APS. Their ability to generate structure allows underwriters to search key words and diagnoses, quickly referring to pages in the text. The ontological mappings and their confidence levels can also be ingested by decision engines.

While OCR and NLP have been around for a while, use in medical documentation is more recent. Medical records pose unique challenges in that different EHRs and medical providers organize concepts differently. There are challenges with things like negation: for example, "Personal History of Pancreatic Cancer" is different than "No Personal History of Pancreatic Cancer" or "Family History of Pancreatic Cancer."

A good solution reflects any limitations and represents them in outputs with caveats about confidence and insight into the derivation of its suggested outputs. A holistic solution has a robust human audit process and is constantly evolving its terminology servers in a constant state of training. Medical documents are diverse, differing from patient, physician and medical record platform. This technology is new in the life insurance industry and the medical record use case, but is emerging quickly.

Notably, AI technology is only as good as its "training." Underwriters should engage any AI/NLP solution with a keen eye to audit, as misinterpretations due to factors such as misspelling, lack of context, slang and colloquialisms are all possible. Sufficeit to say, these services are automated; their ability to offer consistency and scale are key competitive advantages over manual review.

EHR Use Cases

EHRs have several uses in the current life insurance life cycle. Given their ability to represent both cleanly structured clinical concepts bound by ontologies and unstructured narrative text that can serve as the adjectives and adverbs of these structured concepts, they lend themselves very well to automation and to traditional underwriting.

For the former, an automated underwriting engine need only create knockout rules to exclude certain ICD10s or SNOMEDs of Diagnoses or RxNorms of medications to be able to kick a case toward traditional underwriting. Moreover, the medical concept classification system has groupings of ICD10s and SNOMEDs for clinical concepts like diabetes, which can shorten the lists of knockout concepts into lists of groupings, or a list of medications into the opioid class. Other accelerated underwriting use cases include post-issue audits for cases that are approved in a fluidless manner.

For the latter, the obvious use of EHR in traditional underwriting is as an APS replacement. They can also be used for cases that enter an accelerated underwriting channel but get referred to an underwriter, who determines that more comprehensive medical records are needed. These EHR records can be obtained quickly and are relatively inexpensive, and can be valuable to identify material misrepresentation.

EHR use in claims adjudication is gaining popularity. In this use case, as in the accelerated underwriting use cases, the speed at which the records can be obtained, plus the broad coverage of EHRs, is advantageous. Based on the same 2023 AHOU poll described at the start of this article, most companies (58.8%) are deploying EHR in a multitude of different ways (Table 2).

Table 2. Company EHR Use. How Are Companies Using Electronic Health Records Today?

How does your company use electronic health records today?	
1.47%	Claims
23.5%	UW – APS replacement
5.88%	UW – Accelerated UW
4.41%	Post issue/audit
0.0%	Informal inquiry
5.88%	No plans to use
58.8%	Multiple of the above

Poll data culled during the Future of Underwriting at the 2023 Association of Home Office Underwriting meeting.

Proposed Implementation

EHR data offers the advantage of a fixed cost for medical records in a timely fashion. It provides structured data that can drive automation for simplified processing and, at a minimum, yield a table of contents for traditional underwriting that can serve as the triggers to do a deeper dive into the narrative text imbedded in them.

In terms of cost, most data vendors allow carriers to do an inquiry at no charge.
- If there are "hits," a carrier can purchase selected data they would like.
- With "no hits," or situations where the vendor does not have a record for the client, no charge is incurred. Consequently, carriers and APS vendors will attempt to obtain EHR data prior to pursuing the APS from the named physician.

The challenge is that EHR vendors will generally list the data source by the medical system within which the doctors practice, rather than by the doctors' names, creating broader coverage but sometimes failing to locate the specific records needed. With the increase in the number of vendors supplying data, a more thorough approach could be to obtain EHR data from multiple providers before defaulting to the APS.

Carriers often mention "hit rates" as the rate-limiting step. Understanding that data organizations access data from a myriad of different Health Information Exchanges (HIEs) and EHR vendors, this approach could work favorably to increase hit rates to 70% or more, depending on the geographic region and market penetrance of certain EHR platforms in those geographies. As the data sources mature, optimal algorithms will emerge to maximize the hit rate and minimize the cost and time to obtain records.

When ordering EHRs, it is important to understand the data source, since the sources of data can vary and come with varying degrees of completeness and syntax. Sometimes the records are Continuity of Care Documents (CCDs) obtained from a local HIE that have undergone some degree of data normalization. At other times, they come directly from an EHR used by a physician at the point of care and, therefore, represent raw clinical data. Patient portals are also a source and sometimes represent windows of care that the treating provider wanted to share with a patient. Our first article in the June 2023 issue of *ON THE RISK* addressed the strengths and weaknesses of these varied sources and formats.

HIE information is a great source to corroborate a clean medical history, as it will include a listing of all major problems in the health history, along with a listing of every visit, any laboratory tests completed, and providers sending data into that HIE. It may have missing data elements, particularly if data generated by certain encounters was not sent to that HIE, or if data was transacted in a more unstructured format. The data will likely contain visit dates and ordering information of certain tests, like radiology studies, but may not contain the reports of these studies.

Analysis of the trends of data presence/absence by data source (HIE vs. EMR) is critical to establishing optimal ordering algorithms and workflows, which need to be aligned with the organization's underwriting philosophy. An organization may consider fine-tuning its strategy to overcome information bias and refine its pathway for acquiring data needed to make informed and evidence-based decisions. This is the art of underwriting and the direction of the industry: obtaining only what is necessary to make an informed, cost-effective and time-efficient decision.

Understanding the difference between structured and unstructured data is a critical first step to building out a comprehensive plan for fully utilizing EHR data.
- *Structured data* is organized into specific formats based on the needs of the health care industry. EHR contain a wealth of information in structured format about an applicant's medical history, including diagnoses, treatments, medications and lab results.
- *Unstructured data* is an amalgamation of data formats such as narrative notes, radiology notes and physician summaries.

By using structured data, underwriters can leverage information to make more informed decisions about insurability and pricing. It provides a more complete and more accurate picture of an applicant's health status, which can help reduce the risk of adverse selection and improve pricing accuracy at an individual level. There is direct feedback from the industry that this data is easier for the average underwriter to use and understand.

Analytics leveraging structured data view the exact same data with consistent interpretation. Organizations can ingest thousands of CCDs obtained through their network of data sources (e.g., HIEs) in real time, and create dashboards or summaries with key data points all driven from the same structured location within a medical record. This decreases the time for underwriters to review remedial information upfront and allows them to focus on more complex cases. This consistent approach leads to more sustainable and profitable business outcomes.

Leveraging EHR data is not a replacement for an underwriter. It is a way to make their review more efficient while decreasing the burden on them to find the needle in the haystack. As most life insurance stakeholders are being asked to produce more with less cost, structured EHR data standards present the opportunity to streamline operations and improve efficiencies within both the underwriting experience and automation engines.

If an organization is committed to leveraging structured EHR data, it allows all underwriters the ability to collaborate more efficiently. Broad workflows can be developed, resulting in streamlined training and reduction in underwriting time. It also establishes more consistent audit processes. Substantial time savings are evident with improved workflows allowing underwriters to focus on the analysis of unstructured data, which can provide a more granular view into applicant's risk.

While structured data has its limits, it provides the greatest opportunity for automation and digitization. There remains the possibility that by mining millions of unique and untapped codes in the unstructured data, a structure wedded to structured ontology can be generated.

While it may seem like information overload, the evolution of AI and ML can help maximize return on investment from the combined value of structured and unstructured data. To add to the structured data, unstructured data could be analyzed for critical data points that an underwriter is looking to make actionable in a way we mentioned earlier. A combination of structured and unstructured data leveraging NLP and OCR creates all new capabilities when looking at the end-to-end workflow.

Ultimately, change management and adoption are critical to innovation. The best mousetrap is just a mousetrap and may be rendered ineffective if change management is not also considered. People need to know how to use it to maximize its value. They need to understand why it is better. Innovation is not about the technology, but the adoption of the technology. To ensure that the new workflow is adopted, the old workflow must be phased out. As long as APSs are commonplace in the industry, there will always be a tendency to resort to them when things seem different with EHRs. If both APSs and EHR outputs are present in workflow, human nature is to eventually regress to what is comfortable.

Lastly, traditional underwriting involves reading an encyclopedic amount of medical information on an applicant from cover to cover. If this encyclopedia contains a table of contents with entries for cardiovascular disease, sinusitis, urinary tract infections, history of Stage 2b breast cancer and evidence of alcohol misuse, then a great researcher will go to those sections in the table of contents to learn more. While it is thorough to read the encyclopedia from cover to cover, there is a substantial chance that going through the sinusitis and urinary tract infections probably provides less yield from a risk selection standpoint than the cancer, cardiovascular disease and alcohol misuse. Structured data in the EHR is that table of contents that can drive an efficient read of medical documents that are linked together. Both structured and unstructured data exist in the chapters that can provide a rules engine or underwriter enough data to make an informed decision, manually on the most complex cases and in automated fashion on the least complex cases. Doing so probably does not give away a lot of mortality when operating on the law of large numbers.

The Path Forward
EHR data is here to stay, and the insurance industry needs to evolve and adopt this increasingly important technology. Our industry faces a new imperative: to be cost- and time-effective. There are strengths and weaknesses to any data strategy, even those data strategies employed by most carriers to date. This article broke these strategies into four broad groups:

1. The use of underwriters to abstract data from an encyclopedic read of the expansive medical documents in PDF format, while thorough, bias exists, and this process is time ineffective and inefficient.
2. The use of vendors employing human annotators – this suffers from the same bias and time inefficiencies mentioned in No. 1. Moreover, because of the human element in underwriting, it does not obviate the need for internal resources for validation.
3. The use of AI/ML solutions solves the bias and time issues, but these models need to be trained and taught. Humans do the training and can inject bias. There is also enough variability in how the data providers deliver to make a "one size fits all" output a challenge.
4. Lastly, the combination of structured data from EHRs, structured data from AI/ML workflows that structure once unstructured data, and human oversight. This triad allows a contextual table of contents to be generated with the ability to dive into critical chapters of an applicant's medical journey. Advanced technologies can surface patterns capable of being substantiated by the existing structured data and validated by the underwriters. It can also use the underwriters and

medical directors on cases that are most complex and generate the greatest amount of doubt. All three actors in this effective triad interact meaningfully and benefit from continued iteration.

Change management and adoption are critical to the path forward and done in part by removing the information bias that has been so common in our industry. Turning off APS streams when they are not necessary is equally important, as human nature embraces the familiar. Lastly, underwriting jobs will not be lost to machines, but underwriters ready to evolve to adopt machines will replace those who are not.

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Andy Kramer, FLMI, ACS, has over 30 years of experience in many facets of the industry, from full underwriting at a primary carrier, direct to consumer simplified underwriting, and reinsurance underwriting. Throughout his career he has focused on process improvement activity, which includes obtaining his Six Sigma Master Black Belt certification at GE and overseeing two major underwriting system implementations. Andy has an MBA from the University of Missouri-Kansas City and a BS from Saint John's University (MN).