WHY UPCYCLING DATA™ MATTERS

Diameter Health

Turn Data Potential
into Data Power

CLINICAL DATA CAN BE A **POWERFUL, STRATEGIC ASSET** WHEN IT IS ACTIONABLE, ACCESSIBLE, AND PREPARED FOR USE.

Whether you're responsible for the clinical, operational, or data management side of your business, you can benefit from the cleanest, most precise data: Upcycled Data.™ In this Brief, we dive into the fully automated process to improve clinical data quality and share why it matters to stakeholders across the industry.

Clinical data can be a powerful, strategic asset when it is actionable, accessible, and prepared for use. Organizations across the healthcare industry are investing significantly in acquisition and ingestion of many different sources of clinical data but realize the journey to effective use has just begun. Coding variation within and across sources, due to a lack of adherence to standards and inconsistent documentation workflows, creates an overwhelming amount of complexity. This complexity starts with variation in how a single data element is coded, such as an HbA1c lab test, then increases exponentially when looking across all lab tests and then across all clinical domains. At Diameter Health, we've seen over 100 different variations of code and description for HbA1c tied to one LOINC code. Imagine the scale of the problem when looking across all lab tests,

all medications, all problems, all procedures, and more. Diameter Health's solution solves this content challenge through semantic normalization to ensure standard, interoperable clinical data can be used as a strategic asset for decision making.

+100 VARIATIONS IN DESCRIPTIONS AND CODES FOR HBA1C, WITH A SINGLE LOINC CODE

IMAGINE THE VARIATION ACROSS **+2,000 LOINC CODES** FOR COMMON LAB TESTS

THEN THE VARIATION ACROSS **10 MAJOR CLINICAL DOMAINS** PER CCD

In order to make large sets of multi-format clinical data usable, healthcare organizations may attempt to leverage in-house resources and teams of data analysts. However, these approaches are costly, not scalable, and yield a modest return in terms of data usability. Further, the work is never done, as each new data source requires mapping and data volumes continue to explode over time.

In a recent ROI analysis conducted with a major health plan customer, we identified hundreds of millions of dollars in cost avoidance due to the automated Fusion technology that saves hiring and deployment cost and time for data scientists to standardize, aggregate, and enrich clinical data for broadscale application.

OBSTACLES TO CLINICAL DATA USABILITY

Incorporating clinical data into workflows and analytics has great potential to improve health and operational efficiency. But there are challenges that must be addressed to unlock that potential. Some of those challenges contributing to the significant variation include:

- **Non-standard, erroneous, or missing codes** in data sourced from EHRs, labs, and HIEs, limiting its use in analytics

- Information frequently **documented in incorrect places** in the medical record

- **Duplicate entries** of the same prescription or diagnosis, obscuring medical facts under mountains of information

SO, WHAT IS UPCYCLING AND WHY IS IT THE SMART CHOICE FOR MAKING CLINICAL DATA ACTIONABLE?

Upcycling Data™ is the process of aggregating clinical data from multiple sources and transforming it into a data asset that can be readily used for multiple purposes. Upcycling data starts with normalizing codes to national standards. It extends to filling in data gaps caused by poor documentation and enriching the data so that it can be analyzed, searched, and shared.

Upcycling data also includes aggregating and summarizing data from multiple sources into a

longitudinal record in which duplicate entries have been removed to make the information complete and streamlined. All this is completely automated, in near real-time. And when we update our software to incorporate new codes and standards, those benefits are realized instantaneously across all data. Finally, upcycling takes into account the need for flexibly integrating clinical data into your infrastructure and data processing pipelines, exchanging it using standards like FHIR, and deploying data fit for specific business purposes to drive immediate value and ROI.

In the Medication and Diagnosis domain examples below, we highlight a few real–world examples of clinical data challenges and how the process of Upcycling Data executed by Diameter Health's automated Fusion technology is essential to realize the benefits of clinical data across many use cases.

UPCYCLED DATA IN ACTION: ACCURATE MEDICATION DATA FOR CRITICAL DECISION MAKING

Inbound Data	Upcycling Process	Upcycled Data	Why it Matters
Vicodin 5/300 NDC code 00074–3041–13	Normalize to national standards at the generic drug level	RxNorm code – 856987 *(acetaminophen 300 mg / HYDROcodone bitartrate 5 mg oral tablet)*	Each brand name drug (e.g., Vicodin, Norco) has a different NDC code, but the generic drug information can be normalized to one single RxNorm code that includes the route and dose information. Normalizing unambiguously to national standards supports interoperability, human reasoning, analytics and more. Examples of usage: • Adhering to interoperability requirements. For example, the FHIR standard requires use of RxNorm in the Medication and Allergy Intolerance resources. • Establish a crosswalk to medications on medication–driven quality measures, streamlining the workflow.
	Normalize to national standards at the core ingredients level	RxNorm code – 214182 *(Acetaminophen + HYDROcodone)*	In addition, each medication is normalized to the core ingredients level, enabling high–level consolidation that benefits use cases such as: • Querying by base ingredient in the case of allergy or adverse event identification. • Querying across an individual's record or within a population to identify patterns of usage. • Establishing a crosswalk to a medication that is on a particular formulary, reducing cost.
	Normalize to national standards at the decomposed ingredients level	*Component 1: RxNorm code 161 (acetaminophen) Component 2: RxNorm code 5489 (HYDROcodone)*	Decomposing to component ingredients and normalizing to an RxNorm code for each ingredient provides additional information about a medication. Examples of usage: • Enriched data helps a clinician make better decisions. For example, a clinician could avoid prescribing or dispensing Vicodin to someone with an acetaminophen allergy and simply look to prescribe hydrocodone. • For a public health initiative, the data can be queried to identify a population on a particular controlled substance without needing to use all brand names – e.g., all patients on hydrocodone.

| Inbound Data	Upcycling Process	Upcycled Data	Why it Matters
Vicodin 5/300 NDC code 00074–3041–13	Display with Tallman lettering	*acetaminophen/ HYDROcodone*	Tallman lettering supports human reasoning with information that's easier to absorb. This helps a clinician or medical reviewer to avoid confusing HYDROcodone with oxyCODONE. This is particularly impactful when two medications that look and sound alike are in different classes and have different side effects and contraindications.
	Classify by pharmacologic class	*Opioid agonist*	This additional information is useful both at the patient and population levels. • Assess patient safety by identifying morphine dose equivalents for all drugs in the medication class "opioid agonist" • Query by "opioid agonist" to discover trends in a population
	Classify by controlled substance scheduling	*Schedule II*	This additional information is useful both at the patient and population levels. • Avoid toxic drug/drug interactions when prescribing multiple controlled drugs to a patient – e.g., benzodiazepines and opioids • Reveal patterns indicating over–prescribing or drug diversion behavior in a population
	Find and normalize start and end date for prescriptions and append medication status	*Active*	Identifying whether a prescription is active or in the past can be used to make data more digestible for human reasoning or for downstream applications. For example: • Eliminate duplicative prescription entries in an HTML rendering of the data for underwriting • Eliminate duplicative entries in a longitudinal record for care management or medication reconciliation • Identification of clinical decline – a patient previously treated 3 years ago for pain who is suddenly back on pain medications
	Create a longitudinal record	A defragmented, deduplicated, chronological view of the patient journey along the care continuum and agnostic of location of care	The deduplicated longitudinal record generated by Fusion is useful for following prescribing trends and for medication reconciliation: • Upon discharge, validate that a patient who was on intravenous medication is appropriately switched to oral (seeing that an inpatient with IV nitroglycerine is discharged with oral sublingual nitroglycerine) • Understanding control of chronic diseases; for example, a patient who is on Metformin 500 once a day, goes to 500 twice a day over the course of months, and continues to 1000 twice a day may be poorly controlled

UPCYCLED DATA IN ACTION: INTEROPERABLE DIAGNOSIS DATA FOR APPROPRIATE DISEASE MANAGEMENT & REPORTING

| Inbound Data	Upcycling Process	Upcycled Data	Why It Matters
Free text documentation "Diabetes mellitus with Peripheral Artery Disease"	Normalize to national standards	Addition of SNOMED code 421895002 "Peripheral vascular disorder due to diabetes mellitus"	Begin to establish the foundation for crosswalking to other coding systems and allowing for downstream applications and queries.
	Map to alternative national standards when available	ICD-10 E11.51 – "Type 2 Diabetes with Diabetic Peripheral Angiography without Gangrene"	Crossmap to the ICD-10 code system makes the data consumable by downstream applications and is required in FHIR.
	Normalize to alternative national standards when available	ICD-9 – 250.70 – "Diabetes with peripheral circulatory disorders, type II or unspecified type, not stated as uncontrolled"	Crossmap to ICD-9 code system makes data consumable by legacy applications that may still use ICD-9 coding system.
	Crosswalk to HCC (Medical HCC Version 22 and 24)	HCC code 18 – Diabetes with Chronic Complications	A crosswalk to the associated HCC code makes the data usable for risk adjustment, specifically for more precise targeting to reduce chart pulls.
	Problem classification code	CCSR code END003 – "Diabetes mellitus with complication"	Uses the Clinical Classifications Software Revised (CCSR) from the AHRQ to enrich the data with information about the severity and chronicity of the condition, for use in clinical and risk adjustment scenarios.
	Problem status classification as acute, chronic, both, or not applicable	Chronic	Using the AHRA's Chronic Condition Indicator (CCI), the problem is classified as acute, chronic, both (e.g., acute exacerbation on an underlying chronic disease), or not applicable. Diabetes Mellitus with vascular complications is considered a chronic condition.

> " DIAMETER HEALTH'S AUTOMATED FUSION TECHNOLOGY IS ESSENTIAL TO REALIZE THE BENEFITS OF CLINICAL DATA ACROSS MANY USE CASES.

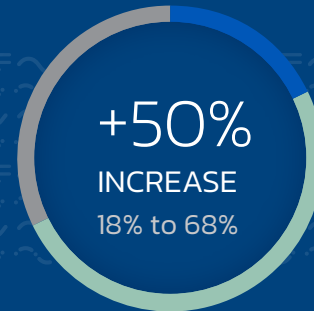## FUSION'S UPCYCLING PROCESSES INCREASE THE VOLUME OF HIGH QUALITY, USABLE DATA

AGGREGATE	VITAL SIGNS	LABS
+34% INCREASE 49% to 83%	**+41%** INCREASE 57% to 98%	**+50%** INCREASE 18% to 68%
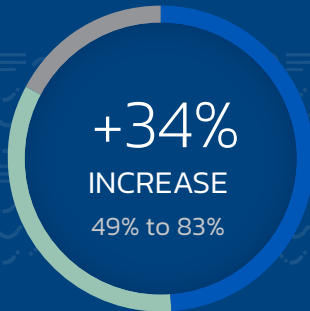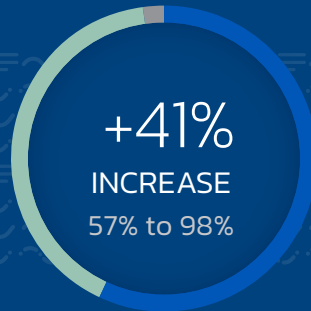
The examples on the previous page relate to just two clinical domains, representing a single medication and one diagnosis. Coding variation and the need for upcycling increases exponentially across clinical domains.

Fusion's upcycling processes increase the volume of high–quality, usable data, automatically. As shown in the chart above, generated from a recent data quality analysis performed across 14 different EMRs, about 49% of data across eight major clinical domains was validated and confirmed usable on the inbound, compared to 83% of data being usable after being upcycled by Diameter Health.

As illustrated, upcycling goes beyond simple terminology mapping and ensures that data is semantically normalized to convey the clinical

> ❝ **DATA ENRICHMENT MAKES THE DATA SEARCHABLE AND READY FOR ANALYTICS.**

intent. But semantic normalization is simply the first step. Data enrichment makes the data searchable and ready for analytics. Beyond normalization and enrichment are functions such as creating a deduplicated longitudinal record and producing data fit for purpose, such as producing FHIR output for patient access.

In future Briefs, we provide additional examples to illustrate why upcycling data matters for analytics, for better clinical decisions, and for interchange and integration.

DIAMETER HEALTH™