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perspectives around the implementation approach – tactical, strategic, replacement and hybrid, a well-planned, ubiquitous effort in the internal and external testing is absolute in overcoming related bottlenecks and achieving timely compliance. The extensive and intensive nature of the ICD-10 testing work is unprecedented in the US healthcare sector. The sheer volume of effort and complexities involved in ICD-10 testing can result in an entire overhaul, especially when evaluated from a time, effort, and cost perspective. This paper will highlight few of the key challenges involved in the exercise, and intends to propose a comprehensive testing strategy that can help organizations overcome possible hurdles and revitalize the transition.

Revitalize Your ICD-10 Transition with Coordinated Implementation and Testing

A Perspective

By Suman De

ABSTRACT

The impending ICD-10 migration that is staring in the face of the US healthcare industry presents both business as well as technological challenges. So deep is the penetration of its impact, that compliance can only be realized by a well-organized and coordinated testing lifecycle.

The criticality of ICD-10 implementation lies in thorough alignment across an organization's business functions, stakeholders, and external partner entities. Collaboration among each of these with respect to alignment of the core business objective of compliance is the key aspect of success. With a number of different perspectives around the implementation approach—tactical, strategic, replacement and hybrid, a well-planned, ubiquitous effort in the internal and external testing is absolute in overcoming related bottlenecks and achieving timely compliance. The extensive and intensive nature of the ICD-10 testing work is unprecedented in the US healthcare sector. The sheer volume of effort and complexities involved in ICD-10 testing can result in an entire overhaul, especially when evaluated from a time, effort, and cost perspective.

This paper will highlight few of the key challenges involved in the exercise, and intends to propose a comprehensive testing strategy that can help organizations overcome possible hurdles and revitalize the transition.

KEYWORDS

ICD-10, implementation, coordination, collaboration, testing, transition.

THE TRANSITION to ICD-10 is an extremely critical project, with interleaved financial, clinical and operational impacts, affecting all segments of the value chain for healthcare businesses. Testing is therefore crucial to the adoption of the new code sets. Effective ICD-10 testing will help ensure that all systems processes, interface, business rules proactively align to accept and process the new codes and formats uninterruptedly. Any disruption in the orchestration can seriously affect the business, productivity, revenue outcomes—endangering the overall compliance.

ICD-10 implementation is a unique process. Thus, standard system testing lifecycle models will not suffice. Each organization with its own mix of applications, process flows and dependencies should aim to validate the compliance to the new codes uniquely and across the following priority dimensions:

- Business process: Validation of workflows from start to end of the impacted business process.
- System remediation: System validation of applications against business requirements to ensure overall ICD-10 compliance.
- Vendor readiness: Ability to ensure business continuity with external organizations, trading partners, providers, software

vendors, and content providers.

▪ Enterprise neutrality: Verification of clinical, financial and operational neutrality across organization.
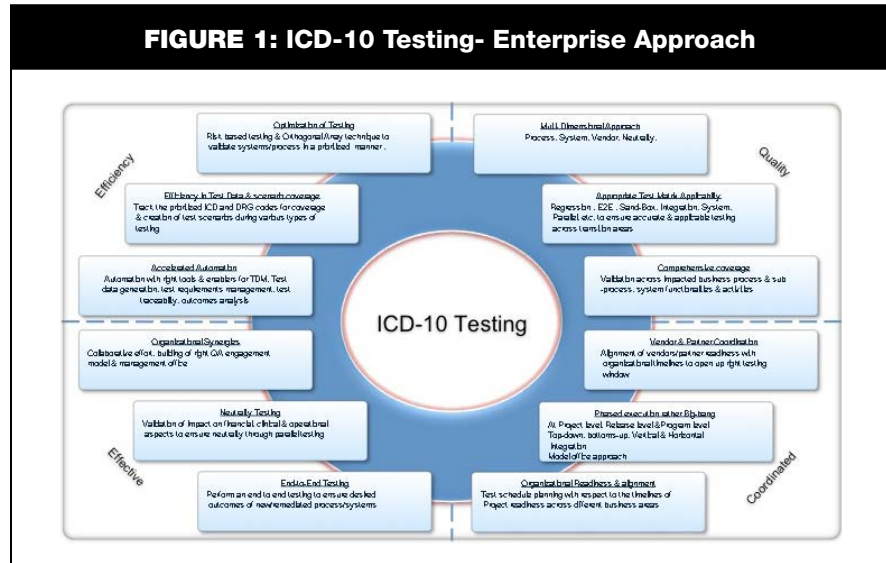
To assure that the testing is optimized for desired outcome, it is imperative to draw a strategy that will comprehensively address the testing need and develop a collaborative and cooperative approach to ICD-10 implementation, assuring a successful and risk-free compliance.

ANALYZE THE COMPLIANCE STRATEGY

ICD-10 adoption will drive significant modifications in an organization's business rules, transactions, processes, data sources, and system workflows. These will be related to the processing of the ICD codes, both internally and externally, leading to ideation of various adoption principles. Depth and nature of testing will depend heavily on the organization's remediation approach. There are various remediation approaches possible from the business perspective. Few approaches are likely to be used more than others but predominantly it will be a mix of these approaches. Processes, system configurations based on the organization's ICD-10 implementation waves will invariably influence the test approach and planning. Considering the different adoption strategies organizations need it will derive the key testing considerations and the applicable testing techniques to be leveraged.

The "replacement" option involves replacing existing systems where implementing ICD-10 is highly cost prohibitive and the risk of not being able to complete migration of the business from the old to the new platform by the compliance date is low. The "hybrid" is a dual utilization technique that will allow the processing of both ICD-9 and ICD-10. "Strategic compliance" to ICD-10 through complete remediation of the existing platform and business operations is the desired end state of all organizations to realize the benefits of the ICD-10 data. The "tactical" or neutralization' option involves a crosswalk to convert data from ICD-9 to ICD-10, or vice versa, so that the existing business process will in majority remain unchanged or change will

FIGURE 1: ICD-10 Testing- Enterprise Approach

be minimal so it can handle the new codes. These will be the dominant options for any legacy platform that are either too difficult or too expensive to be remediated and are targeted for sun setting in the near future.

With any of these approaches, organizations need to estimate the key considerations to identify the applicable test types that will further define the testing blue print.

The following diagram gives an overview of the various ICD-10 adoption strategies and its implication to testing:

Some key facts to be evaluated with respect to the remediation approach are:

▪ How many systems are/will be involved?

▪ What are the dependencies?

▪ Which key processes impacted in the organization—internal and external?

▪ What among the impacted processes should be considered as drivers for test scenarios?

▪ How various interfaces will accommodate ICD-10?

▪ Based on the remediation strategy, what will be the possible impact on the care continuum processes (e.g. clinical documentation, care delivery, billing, contract management, HIM, claims, denial management, etc.)

▪ What are the key data stores that will be impacted by the remediation activities?

▪ What is the mapping strategy and usage?

Whichever is the adoption principle it is imperative to account business partners in the compliance process. Industry lesson from 5010 testing program revealed that inability to define the right window for partner/external vendors testing delays the overall compliance. Organizations need to identify, categorize and prioritize partners, estimate their readiness, dependencies, variations in system upgrade, and code conversion principle. This will help to align the test cycle with the partners appropriately, with the right set of test scenarios, appropriate environment, and evaluate test results both clinically and financially, as desired.

CURVE OUT THE TEST PLAN

The next step is to develop the business, technical requirements, and use cases from the identified impact across the key areas of transformation—process, system, partner in conjunction to the ideated adoption strategy. This will be a key input to develop the test plan.

Organizations need to accommodate different IT architecture pieces, remodeled process, and updated business rules, which will be tested concurrently during the build, modification and go-live process—in alignment with the defined project schedules and release timelines.

ICD-10 testing will require several batch jobs to be run, which will increase the time taken to execute a test case. Example, the

FIGURE 2: ICD-10 Testing- Enterprise Approach

Solution Strategy	Criteria	Key testing considerations	Focus testing types
Replacement – A complete amendment to upgrade all the impacted applications to ICD-10. This approach is definite to bring a significant reengineering of the existing business processes & systems.	• Platforms where implementing ICD-10 is highly cost prohibitive • Risk of not being able to complete migration of the business from the old to new platform by the compliance date is low	-Is it a COTS product or being developed in house? -If it is COTS, is the vendor guaranteeing ICD-10 compliance? -If it is in-house, is the database also changing?	-Functional Testing -End-to-end Testing -Neutrality Testing
Hybrid – Develop the ability to process ICD-10 codes, while retaining the ability to process ICD-9 codes as well	• Flexible platforms that don't have spaghetti code where implementing dual processing rules is going to create critical risks and testing overhead	-Are additional databases being created to handle ICD-10 codes or are the current databases being updated to handle both ICD-9 and ICD-10? -Will trading partners have the flexibility to send both codes?	-Data migration testing -Data Aggregation testing -Dual support testing -External testing -Regression testing -Neutrality Testing
Strategic Remediation – Develop the ability to process ICD-10 codes, without retaining the current ability to process ICD-9 codes	• Strategic platforms • Less flexible platforms, where ICD-10 can be implemented but maintaining dual processing rules can be a risk	-Is old data being migrated to new database? -Are multiple instances (old and new) being maintained? -How will the operations with trading partners be handled while moving from Level-I compliance to Level –II compliance?	-Regression Testing -Data migration testing -Data Aggregation testing -External testing -End to end testing
Tactical /Neutralization– Insulating the ICD-9 processing systems from the ICD-10. Potentially, it's a play with forward & backward crosswalk. The existing business process will mostly remain unchanged or will change minimally with the introduction of a crosswalk.	• Platforms on track for sunset by end of 2014 and the ICD-10 support is needed for just few months • Platforms supporting very low transaction volumes • Platforms that are cost prohibitive to remediate or neutralize • Platforms that are highly inflexible and making any significant changes to the platform can cause wide-spread disruption	-Will incoming ICD-10 values be stored and be used by backend systems for additional processing? -What is the strategy to handle codes not addressed by the crosswalk?	-Crosswalk testing -Functional testing -External testing -Regression testing

batch jobs for claim finalization, EDI file processing, etc. Organizations must not only plan, and estimate for the application downtime, but must evaluate the possible overlapping testing environments (schedules), test data dependencies, lead time in resolving conflicts due to dependent projects, partner-testing timeline requirements, etc. Acknowledging that such a large and complex initiative is prone to encounter multiple schedules variances, interdependencies and constraints, adoption of a hierarchical testing as mentioned below will be beneficial over any big-bang approach.

Project-Level Testing. This will be relevant to address the functional requirements associated with each of the projects. It will typically include system, integration, user acceptance, regression, and performance testing of the ICD-10 requirements.

Additionally, testing with all software vendors can be performed at the project level depending on their readiness and willingness to undertake it. Project level testing may also automate select system and integration test cases for future regression purposes. Projects that are early in the program will create the initial set of scenarios. The test bed can be built incrementally over the life of the program.

Release-Level Testing. Release level testing is crucial especially when there are inherent testing dependencies across ICD-10 and non-ICD-10 projects in the organization. Focused ICD-10 release level regression testing will help ensure that there is higher coverage for ICD related processing because the bulk of ICD-10 code is cold code. Release level testing will include system and UAT regression of the applications

planned as per the release calendar. Release level testing may also consider various select automation test cases for regression of code before go-live.

Program-Level Testing. Program level testing includes complete cross-domain, cross-functional testing of all ICD-10 related business processes and will comprise end-to-end testing when most of the system, process enhancements are completed as a part of separate projects. The completion of the project and the release (optional) will mark the entry criteria for program level testing.

Moreover, this plan must go beyond covering the techno-functional requirements and must include outcome-based testing of business operations—the inherent criticalities of ICD-10 transition. This will ensure that the defined goals, financial neutrality,

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clinical integrity and operational stability are met.

ADDRESS THE KEY CHALLENGES

Test Scenario and Data Creation. The development of business scenarios and the identification of the right test data for ICD-10 testing is a domain intensive and critical challenge. It will be important to provide consistent test data and scenarios throughout the testing process to assure that processes and systems are working in tandem. Accounting for the large number of ICD-10 codes, which will be loaded, implemented in program logic and collaborated with internal and external systems is just one aspect of the challenge. The bigger complexity will be on the ability to identify and replicate the critical business workflows, associated logic to validate the typical, and any atypical outcomes. Example, how the codes will be used in the remodeled clinical, and financial processes, in a manner that they do not influence decision-making and contribute to an unexpected financial outcome.

The consistency and the right combination of test data needed for adequate coverage of business scenarios are important in achieving the testing goals. This process will require involvement from the business, as the test data created must satisfy the business scenarios. Respective business areas should identify the scenarios that can cover the business requirements across processes and domains, new or modified functions, risk spots, cross-functional relationships, and combinations to validate from basic compliance to operational, clinical, and financial outcomes.

Scenarios for ICD-10 testing have to be prioritized, and at the same time, it should be optimal to ensure maximized test coverage. This will be an entry point for undertaking a risk-based testing. Top ICD-9 codes, DRGs across various business processes, and transactions that are expected to produce financial, clinical, and operational imbalance with ICD-10 changes that need to be identified and analyzed. These are:

Contract significant diagnosis, procedure, and DRG codes.

- High volume, high dollar, and high risk codes—DRG / ICD codes.
- Business rule specific codes.
- Code related to conditions that have changed clinical concepts/descriptions in ICD-10.
- Codes having multiple/complex/unmapped relationship in GEMs.
- Codes from areas with high risk of exposure and widespread impact.

It will be obvious that with the large volume of ICD-10 codes, the number of test scenarios will increase exponentially. To optimize the number of scenarios and ensure maximized testing at the same time, it is advisable to adopt optimization techniques, risk-based testing, or the orthogonal array technique.

The generation of a high volume of varied, contextual test data may require native coding of clinical documents, in addition to using mapping based converted historical claims transactions. In such cases, it will be important to have rich clinical documents that are able to support added granularity of the ICD-10 codes. In many cases, existing test suite reusability should be evaluated to save effort, time, and cost. A plan should be put in place to mitigate any risk of test data overstepping that might arise due to sequential testing and usage of the same test environment by multiple teams.

Test Environment. The success of any testing depends heavily on the availability of an adequate test environment. Test execution can be affected if an appropriate test environment is not available and accurate dependencies are not evaluated. To understand the complexity of ICD-10 testing, it is important that business processes, data, and IT requirements for ICD-10 are determined far in advance. The appropriate test environment is prepared, and it is determined if any existing test environments within the organization can be reused, such as those used for enterprise system and 5010 compliance. It is also critical to understand how the current test environment will be impacted by ICD-10 enterprise testing. Test regions, which closely resemble production environments, will probably be required. In addition, if there are any performances, reliabilities, or security requirements the test environment needs to be prepared to support its testing. It is advisable to start with the existing environment, subsequently determine the changes needed, and adapt accordingly. If organizations are relying on the vendor to provide ICD-10 support, ensure that requirements are in place well in advance. Issues in configuration and release management can create issues in the test environment, which will affect all the testing projects using the environment.

Communication. Results from testing must be communicated to the originators of, and others involved in, the testing process to measure those results against the expectations of all involved. Partners will need to know the results of testing of their submitted transactions, e.g. claims, authorization/

prior-authorization requests. If approved for payment, how does the projected payment compare with experience for a like scenario? If the payment is withheld or a claim is denied, or audited, do they have ample documentation to support the claim – compared to what was sufficient in the past for a like scenario? Only by communicating the results to the partners can these questions be answered and necessary process changes can be implemented, retested, and verified.

As with all test effort, metrics play a key role in determining the success and failure of the test cases and the overall validation to ensure that intent and outcome are met as anticipated. In addition to recording the metrics of test execution like defects, test coverage etc., metrics pertaining to the business process like clinical specialties, service categories should be added to determine the overall completion of the transition to ICD-10 codes. Metrics must be clearly defined, standardized, and monitored during the testing phase to ensure that ICD-10 codes produce the expected outcomes. Metrics and thresholds affect other business functions like administrative turnaround times, call volumes and payment accuracy must be recorded based on current key performance indicators and used to establish success criteria, detect failures, and flag risks to overall business processing efficiency.

EXECUTE TESTING ACROSS THE KEY FOUR DIMENSIONS

System Testing. The criticality of this testing is on the ability to ensure that with the ICD-10 adoption, the behavior of the whole software/system as defined in software requirements specification, i.e. the workflow, logic, flow of data/information/ control from one application to the other is uninterrupted and are as desired. Typically, organizations need to consider the following under this type of testing:

- Sanity testing (or) Smoke testing.
- Unit and Functional testing (multiple cycles until defects identified is within acceptable limits).
- Non-functional testing (Stress, Load, Performance, Usability, Maintenance and Security Testing).

Additionally, two critical aspects of system testing are:

Integration Testing. This aims to ensure connectivity between applications as per the business workflow. Organizations can adopt a Big-bang Integration Testing Approach, if all the components in the given business flow are ready for deployment for the same release, else Incremental Integration approach can be practiced by deploying and testing small components, e.g.:

- Top down strategy: Either depth first or breadth first. Utilize stubs until actual application is ready.
- Bottom-up strategy: Process starts with lower level modules with critical functionality.

It is necessary to consider that, integration testing would just ensure the connectivity and data flow between applications and will not completely focus on functional requirements. The primary emphasis is verification of inter-function interfaces, and this will be done for critical scenarios for all external interfaces and high-impact applications. The prerequisites to undertake integration testing are:

- Unit testing and functional testing for an individual application is complete, and all critical defects have been resolved.
- Inputs from business to identify critical scenarios are available.
- Entry and exit criteria along with data flow to and from applications for critical work flow is defined.

Regression Testing. The nature of code changes for ICD-10 adoption is expected to be wide spread even though the functionality changes would be minimal. In spite of some business processes changing, there will be quite a number that will not. One needs to ensure unchanged business functionality continues to work flawlessly. Organizations can prioritize business processes to be tested, and they need to leverage the "3 testing" paths to get the best out of the before-picture / after-picture mode of testing. For example, when the code to be tested is in path 2, the path 1 can be used to take the before picture (same as production code) and compared with results obtained from path 2. Regression testing will be best suited for applications having no functional

requirement changes (even though code changes are involved).

Process Testing. In addition to typical system-testing types, that encompasses system, integration, regression, and user acceptance test; there is a need for validating the upgraded business process flows from an end-to-end perspective. A use case based testing can be an optimal approach to undertake the process testing.

Use cases such as 'care continuum' that will encompass end-to-end processing of newly coded clinical data, i.e. the patient diagnosis from the point of scheduling, registration, to care delivery, clinical documentation, coding, grouping and charge capture followed by claim generation, to reimbursement, denial, data collection and reporting. This will help validate the ICD-10 compliance for various processes working across business domains in tandem. Such a use case, could be constructed to: (1) narrowly reflect the care services provided by a physician in an ambulatory setting for a specific condition, (2) broadly reflect the services delivered in a care setting by multiple providers, such as the physician, and the hospital during an inpatient stay, (3) extensively, encompass the collaborative care services delivered across multiple provider settings for the treatment / management of a specific condition, (4) any combination and variations along this continuum.

Identification of codes associated with high cost, complex, most frequent, high dollar conditions with adequate clinical documentation is critical to successfully design such as process testing model.

Few examples:

- High volume/frequent codes—Cerebrovascular disease, chronic obstructive pulmonary disease, diabetes, pregnancy.
- High dollar codes—Hip fracture and replacement surgery.
- Codes with change in condition definitions—Acute myocardial infarction, newborn.
- Codes frequently driving DRGs and payment variances—injury, orthopedic, etc.

Vendor Testing. There will be significant instances where organizations will use a third party vendor to support some

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of their transition activities. The level of support will vary from the purely technical (e.g., ability to identify and accommodate ICD-10 codes) to business (e.g. some of the process changes). In both cases, there will be a need for testing, validating the interfaces that the vendor exposes, ensuring that the desired functionality is achieved, or test that the vendor system workflow marries the existing business process.

In this category of testing, it will not be enough to ascertain that one can transmit and receive ICD-10 codes with their trading partners. However, there is an obvious need to check that trading partner is producing the correct ICD-10 code to get the expected result specific to the purpose of the business. For example, a claims engine vendor will upgrade his system for converting ICD-9 claim edits for benefit exclusion to ICD-10, in this case, the vendor may still consider 386.04 ICD-9 code for Meniere's disease as an inactive coverage code overlooking that in ICD-10, 8109 for Unspecified Meniere's disease is not delineated as an active or inactive code. Such instances are many, which call for extensive monitoring and analytics.

Neutrality Testing. ICD-10 drives more business changes than technical changes. The added granularity, specificity of the new codes are prone to drive reimbursement variances, great degree of clinical concepts mismatch within business rules, operational imbalance due to productivity loss or for modification of existing processes, etc. Therefore, ICD-10 testing beyond technical requirements must also focus to address the need of clinical integrity, financial neutrality, and operational stability.

Neutrality testing should be driven by risk analysis and data modeling. Such analysis on the identified data set will help segregate the prioritized, high-risk ICD codes (with respect to volume, frequency of occurrence and dollar) across clinical condition categories, service types, reimbursement schemes, partner categories, contract types, etc. They will define the neutrality priority list; contribute in the formulation of test scenarios, and test cases. Parallel testing i.e. simultaneous processing of ICD-9 and ICD-10 data and comparison of respective outcomes is an optimal test methodology that can help ensure neutrality validation.

CONCLUSION

This paper is an attempt to provide guidelines on how organizations can strategize and approach ICD-10 testing to ensure a successful compliance. As can be readily seen from the preceding discussion, this task is complex, needs careful planning, and co-ordination. Various factors such as remediation strategy, the sheer volume of test scenarios, cases that will be required; the number of covered entity participants who will be involved; the key challenge to ensure enterprise-wide neutrality, and the current limitation of test environments, need to be carefully handled as those can be a hindrance to support a full-scale ICD-10 testing – a must for the compliance. **JHIM**

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