

View Point



ICD-10 Testing

- A Prescribed Roadmap

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Abstract

The impending ICD-10 (International Classification of Diseases version 10) migration, that is staring the US healthcare industry in the face, presents both business as well as technological challenges. So deep is the penetration of its impact that for successful compliance every element of the process, every database, and every transaction step needs to be individually tested. The extensive and intensive nature of the testing is unprecedented for the US healthcare sector. The sheer volume of effort and complexities involved in ICD-10 testing can end up testing the entire enterprise.

Acknowledging the fact that ICD-10 testing is going to be a humongous activity, organizations need to develop an optimal ICD-10-centric testing life cycle. While a number of different perspectives abound around the implementation approach, a well-planned, ubiquitous effort in the internal and third-party vendors' system testing is crucial in overcoming all bottlenecks and achieving timely compliance.

This paper highlights some of the key challenges involved in the exercise, and proposes a comprehensive testing approach that can help organizations overcome those hurdles, even as it presents testing strategies.

Introduction

The success of the mission-critical ICD-10 transition hinges on exhaustive testing, both within the healthcare organization as well as with trading partners. With the implementation complex and ramifications significant, simple testing to verify the changed format and contents will not help, as it may for 5010. For the ICD-10 migration, an organization's testing focus needs to be fundamentally different.

The challenges involved in test planning and execution are immense when we take into account the:

- Difficulties of coordinated testing,
- Limitations of the testing environment, and
- Significant involvement of ICD codes in business processes and IT landscapes

In such a scenario, a phased approach is the key to ICD-10 testing success. The approach must encompass the following phases:

- Testing need assessment,
- Test planning and strategy formulation,
- Preparing the test data and testing environment, and
- Test execution

Let us look at each of these phases in detail.

1. Testing Need Assessment

Organizations need to understand that a majority of modifications associated with the transition are changes in their business rules and system workflows related to the processing of the ICD codes, both internally and externally. A detailed impact assessment is important to ensure that all process and system impacts are taken into consideration when:

- [Formulating the test requirements](#)
 - Functional features impacted – screen-level changes in applications, e.g. claims edits
 - Process interactions – provider reporting and medical management
 - As-is and modified process document - compare changes to prioritize test methodology
- [Evaluating the testing scope](#)
 - Test bed management - determine the availability of ICD-10 test data and test environment
 - Across the lines of business - outputs in each case require a different validation. Thus, medical management requires validation from a clinical context while claims adjudication can only be satisfied with the correct code and format check
 - Trading partners involvement - variations in their system upgrade and code conversion principle can produce different outcomes based on the same transaction

Once organizations satisfactorily complete the assessment phase, they can embark on the next phase – test planning and strategy formulation.

2. Test Planning and Strategy Formulation

The complexity of the implementation process makes comprehensive test planning crucial for ICD-10 testing. A planned testing model can ensure that organizations adhere to a structured approach in achieving testing goals. They must have a proper mechanism to plan and strategize for:

- [Priority of hot spots](#)

Inferred from requirement traceability, organizations need to test the ICD-10 aligned areas first, some of these are –

- Associated with business-critical processes and systems, e.g. contract management, claims processing, etc.
- Involved with a high volume of transactions e.g. EDI gateway, claims, etc.
- Related to the number of interfaces, variety and number of codes involved e.g. claims, medical management, reporting, etc.

This can be an entry point for undertaking a risk-based testing.

- **Operational risks**
Identify the probability of a fault occurring and the cost associated with the fault. This helps execute business-critical and high-risk scenarios early in the regression cycle.
- **Time lines and milestones**
ICD-10 testing requires several batch jobs to be run, which increases the time taken to execute a test case, e.g. the batch jobs for claim finalization, EDI file processing, etc. Organizations must not only plan and estimate for the application downtime but must also evaluate the possible overlapping testing environments (schedules), test data dependencies, lead times in resolving conflicts due to dependent projects, partner testing timeline requirements, etc.
- **Internal and vendor application releases**
Each of the organization's platforms has its own release calendar to adhere to, as is the case with vendor products. With the timelines asynchronous, it is important to obtain the release dates early to formulate plans that deal with any slippage.
- **Test methodologies**
The choice the organization makes to either install patches or go in for the necessary investment to overhaul the platform will determine the strategic direction of testing methodology adoption – incremental or waterfall, and tool-driven or manual.
- **Stakeholder dependencies**
The ICD-10 conformance activity largely requires multi-stakeholder involvement. Internal planning and timelines need to be communicated to partners well in advance so that the effort is not disjointed or interrupted frequently.
- **Resources and expertise**
Lack of the right resource at the right time for the program is a high-risk item in testing. Due to multiple ongoing programs e.g. 5010, Meaningful usage NPI and many more, finding experienced resources with the right skillsets from each system is a big challenge. For example, for testing the claims adjudication system, an organization needs to have resources that not only have knowledge of output validation but also have in-depth understanding of business rules to know how the system must respond.
- **Remediation approach**
Various remediation approaches are possible from a business perspective. While organizations are likely to use a mix and match of those available, the selection will largely depend on the organization's business goals. Process configurations based on the organization's ICD-10 implementation waves invariably influence the test approach and planning. Each remediation approach carries its own inherent set of testing strategies and challenges. The remediation approaches are:
 - **Remediation and replacement**
Involving a complete amendment to upgrade all the impacted applications to ICD-10, this approach calls for a significant reengineering of existing business processes. For example, with organizations drawing up new contracts with providers for ICD-10 codes, the entire fee schedule needs to be relooked and recreated based on new codes. The existing business rules playing in validation of bundling/ unbundling and fraud detection logic must be revisited and remodeled. The risk stratification and predictive modeling algorithms in medical management will undergo major changes, leveraging ICD-10's clinical granularity and specificity. These will be managed either through internal customization, vendor upgrades or replacing system operations via outsourcing. In this case, testing is focused more toward validating the newly developed/ changed business processes, workflow and/ or interfaces, integrating the redesigned workflows/ processes/ interfaces with the existing, testing for desired outputs, etc. The focus of testing here is:
 - High for integration testing, unit testing, functional testing
 - Medium for end-to-end testing
 - Low for regression testing

Hybrid

In this scenario, organizations attempt to maintain two versions of the same business processes i.e. one for ICD- 9 and other in compliance with ICD-10. For Example, evaluating the trading partners' preparedness and need for un-mutable historical data, an organization may maintain two claims adjudication systems – one that handles ICD-9-based claims and the other specific to process ICD-10. Thus, there is a need to maintain two business processes simultaneously depending on where the transaction came from or is going to. Since such an approach increases the operational complexity and creates an imbalance in the organization's financial ratios, this is unlikely to be adopted and difficult to sustain.

However, in certain instances this strategy can be beneficial. The organization can leverage it to initiate 'Sand-Box testing' for their ICD-10 upgraded system and process, using the production data in a controlled environment. This can facilitate the readiness assessment and acceptance status of the upgraded products and reengineered processes.

The test strategy for the ICD-10-centric business processes is the same as for 'remediation and replacement'. However, regression testing becomes very important for the unchanged part of the business processes. End-to-end testing has medium focus. Both must be carefully separated for testing and some boundary cases need to be included to ensure that the right approach is selected for varying inputs.

Neutralization

This approach involves insulating the ICD-9 processing systems from ICD-10. Potentially, it's a play with forward and backward crosswalk. The existing business processes mostly remain unchanged or change minimally with the introduction of a crosswalk.

In some cases, organizations can use a frequency-based crosswalk (high-dollar associated codes, most commonly referred codes across lines of businesses, etc.) such that they may create a static map to maintain the payout neutral. In some cases, it may be necessary to use a clinical crosswalk to obtain the closest clinical match. For example, while frequency-based mapping may be acceptable in the claims adjudication system such a map is unsuitable for fraud detection or medical management.

Clinical mapping may be more appropriate for the latter.

The crosswalk-induced neutralization approach is sure to vary for every organization and consequently the testing must have organization-specific variance. At a high level, crosswalk testing is focused just to:

- Verify the code conversion, and
- Validate the new format

But, this is not so simple. Crosswalk testing needs to be based on:

- Where and how the crosswalk is implemented
- How dependable is it for transactions that touch multiple downstream processes, and
- How important is it from a financial impact point of view The testing output needs to be further analyzed to substantiate:
- The clinical accuracy of the converted code (specific to the line of business, as in disease or case management)
- The accuracy of audit trails that account for what is crosswalked, and
- The ability to track back the source code and validate the financial aspect of the crosswalked data (applicable for reimbursements) through Diagnosis Related Groups

In this case, regression testing is very important since the business processes remain unchanged. Integration testing is not as heavily used and assumes a medium priority. However, organizations must make sure that the test cases incorporate all the possible inputs that thoroughly test the maps.

Again, boundary and negative test cases assume importance to ensure the each type of map operates correctly to complete the business process. For example, creating a test case where the ICD code may be a borderline case for clinical mapping (in up-coding, bundling of services, disease-based member stratification), but is routine for the downstream process (claim payment which may use frequency maps).

End-to-end testing is important since the outgoing transactions need to refer back the ICD-10 codes (stored from incoming transaction).

Mix and match

This is the likeliest scenario in ICD-10 testing wherein organizations use ‘remediation and replacement’ for some business processes even as they opt for neutralization for some other processes.

Testing types are similar to those mentioned for the remediation and neutralization scenarios. However, organizations must create smart test cases which test the routing part individually as well as in combination (i.e. boundary conditions and combinations). For example, create a combination test case in which an ICD code may not be a boundary case for ‘remediation and replacement’ but will be for an upstream or downstream process which uses ‘neutralization’.

Post planning, organizations must gear up to execute testing activities. Test execution depends on the available test environment, test data available, scenario creation, and test case formulation.

3.Preparing the Test Data and Environment

In undertaking ICD-10 testing, healthcare organizations must define the business scenario, and prepare the test cases and the test environment for a successful implementation.

Defining the Scenarios

Organizations must define business scenarios when undertaking ICD-10 testing, a critical step in ensuring that all business processes, flows and system interactions are verified to work in tandem and generate desired outputs. The sheer volume of ICD-10 codes, which need to be loaded, implemented in program logic and collaborated with internal and external systems makes the test scenario creation all the more challenging. To ease some of the scenario-creation effort, organizations can assess the reusability of their existing ICD-9 and 5010 test cases to derive the feasible scenarios for ICD-10 testing.

Test scenario definition is also useful to determine – at a high level – the nature of data needed to accomplish testing, and estimate the extent of scenario re-usability across different steps and the associated risks. Test scenarios must be carefully defined to understand the typical and atypical outcomes specific to each line of business. For instance, in the area of contracts with every ICD-10 code and re-negotiated contract data, a brand new result is expected.

Test cases should be prepared based on the following scenarios:

- Positive scenarios
- Negative scenarios
- Boundary conditions
- Real-world scenarios

Unlike 5010, which is majorly IT centric, ICD-10 requires extensive domain knowledge in defining the test scenarios. These include scenarios related to claims edits, quality and reimbursement, age, gender-specific code assignment, facility-relevant coding, accumulators such as Deductible, Coinsurance, Copayment, Life time max, Cal-year-max, and visit max that are based on diagnosis and procedure codes

Once the scenarios are created, organizations must start preparing the test cases. However, evaluating the possible type of testing, as shown in the figure below, that is required helps frame the appropriate test cases:

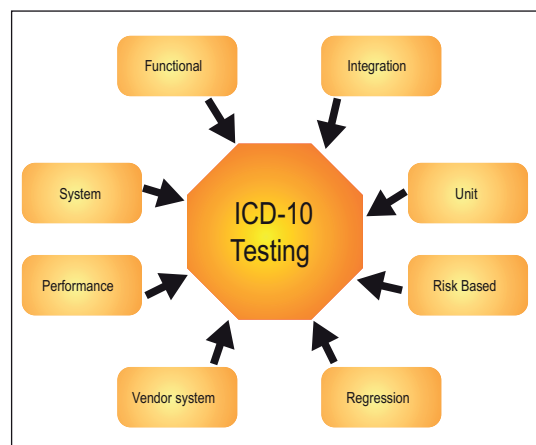


Figure 1: ICD-10 centric TestingTypes

- **Integration testing**

The organization must decide which processes need to be tested individually and how they should be tested in combination. Since it is difficult to envisage too many new business processes at the start, the existing test strategy can be a starting point to identify these processes. This can later be modified to include changed processes.

- **Regression testing**

Since all business processes do not change, the organization must ensure that the unchanged business functionality continues to work flawlessly. Again, the existing test scenarios, with the list and nature of impacted processes, provide a good starting point to identify such regression scenarios. This is particularly relevant for the Neutralization approach.

- **End-to-end testing**

With multiple interfacing applications impacted by ICD- 10, organizations must conduct end-to-end testing carefully to ensure a risk-free production release. ‘Round trip’ testing must be undertaken from the initial creator of the transaction, through to the end processor of the transaction, and back again to the end receiver of the final processed transaction. Thus, the entire life cycle of a process must be tested and validated for correctness to ensure that transactions using ICD-10 codes are properly processed.

Organizations must identify all such ‘end-to-end’ testing scenarios. For example, when testing for the 270-271 request response cycle, an organization must not only identify scenarios such as an enquiry for a specific ICD code or plan (valid and invalid) but also ensure that unchanged processes are not impacted such as sending CPT or DRG codes in a claim etc. Thus, end-to-end testing also includes some regression scenarios.

- **External interfaces**

This differs from ‘end-to-end’ testing in the sense that when there are external producers and consumers of data, exchanges are done asynchronously rather than in a request-response cycle. These include:

- Regulatory and legal reports
- Provider reporting
- Sending of Explanation of Benefits & Explanation of Payments

- **Vendor testing**

There are several instances where organizations use a third-party vendor to support some transition activities, with the level of support varying from the purely technical (e.g. ability to identify and accommodate ICD- 10 codes) to business (e.g. process changes). In all such cases, testing is essential to validate the interfaces that the vendor exposes, ensure that the desired functionality is achieved, or test that the vendor system workflow marries the existing business process.

This is viewed separately from integration testing because vendor testing introduces some co-ordination issues that may not be entirely under the organization’s control. Vendor testing produces additional complications (such as setting up the test environment, co-ordination of release dates between vendors, etc.). Timelines for the availability of the application must be obtained well in advance to plan testing activities accordingly. Forward-thinking organizations must opt to get beta versions to get an early feel for the complexities and estimate the testing effort involved to further ease the testing activity once the final release is made available.

In this category of testing, it is not enough to ascertain that the organization can transmit and receive ICD-10 codes with trading partners. Working beyond this, organizations need to check that the trading partner produces the correct ICD-10 code to get the expected result specific to the business purpose. For example: A claims engine vendor upgrades its system to convert 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. There are several such instances, calling for extensive monitoring and analytic capability.

- **Preparing the Test Cases**

Test cases can be derived from the technical and business scenarios identified with inputs from the test plan, taking into account the dependencies and priorities. Since accomplishing the testing requires highly contextual technical test data, it is important to provide consistent test data and scenarios throughout the testing process to assure that systems are working correctly in tandem. Preparing the test data is a crucial activity and requires some thought, especially for external interfaces and end-to-end testing.

Organizations must identify and prioritize the data to be tested to ensure optimum coverage of ICD-10 codes with different members, providers, and line of business combinations. Test cases need to be built to ensure optimal

coverage and the quality of the test cases needs to outweigh quantity, which guarantees the effectiveness of testing. gain in many cases, some amount of reuse and effort saving is possible if organizations have an existing test suite. Organizations need to be aware of multiple teams using the same environment, and ensure test data overlap is avoided

- **Preparing the Test Environment**

The business process, data, and IT testing requirements for ICD-10 must be determined well in advance and the test environment prepared accordingly to ensure a relatively trouble-free implementation. End-to-end testing schedules can be impacted if the appropriate test environment is not available and accurate dependencies are not evaluated. Due to the scope of changes anticipated, test regions which closely resemble production environments are probably required. In addition, if there are any performance, reliability or security requirements, the test environment needs to be prepared to support its testing.

Interfaces with other internal and external systems must be taken into account while defining data requirements for testing. Organizations need to start with the existing environment, determine the changes needed and adapt accordingly. If they are relying on the vendor to provide ICD-10 support, they must ensure that they have their requirements well in advance and take this into account when preparing the test environment.

Organizations must also consider trading partners when preparing the test environment. For example, if they envisage that most partners will send data in electronic form, then they need to prepare accordingly. They must also create secure access regions for partners during the testing phase and co-ordinate closely with them.

Issues in configuration and release management can create problems in the test environment, which could impact all the testing projects using the environment.

1. Test Execution

The organization's testing model must be made flexible to allow different IT architecture components to be tested concurrently during the build, modification and go-live process, saving time and money. There must be a plan in place for simultaneous testing capabilities, both for internal systems and vendor-upgraded systems. Understanding this huge requirement of end-to-end testing, organizations can prioritize for adopting the spiral or agile over the traditional waterfall methodology. Two recommended methods of execution are discussed below:

Vertical Testing

The vertical mode of testing tests a self-contained business process in its entirety. Organizations need to start with elementary processes before combining them to produce larger business processes. For example, they must check that the electronic data gateway is able to accept ICD-10 codes, separately check for the accuracies in validation and edit functionalities, and in isolation ensure the claims file gets adjudicated correctly by the downstream applications.

Once the individual product/ component performance and functionality is validated, to ensure that the compatibility issues related to upgradation have been resolved, organizations must combine all the isolated functions and check whether the entire process works flawlessly and in tandem. In doing this, organizations must use an incremental approach i.e. combine technical testing and elementary business process/activity testing. If needed, independent parts can be tested in parallel and combined till the end-to-end business process gets executed.

This part of testing not only requires system expertise but also process level knowledge so as to validate each individual and composite step along with the outputs. For example, such testing can be taken as a precursor to installing any new/ vendor upgraded/ modified system that is intended to integrate with a particular existing workflow, and validating the software's performance before placing it in the production environment.

Horizontal Testing

This approach enables organizations to test a specific set of applications as per the business importance and criticality, thus involving testing a small subset of the organization's IT landscape and not just an individual component. This involves testing a group of applications which are inter-related in executing a common business processes.

This helps an organization check for a platform or a system which provides one aspect of the business process. For example, testing the electronic gateway to ensure that it can handle ICD-10 codes and validating its format to check that the validation system works correctly. The same is the case for claims acceptance, its adjudication, pricing and remittance.

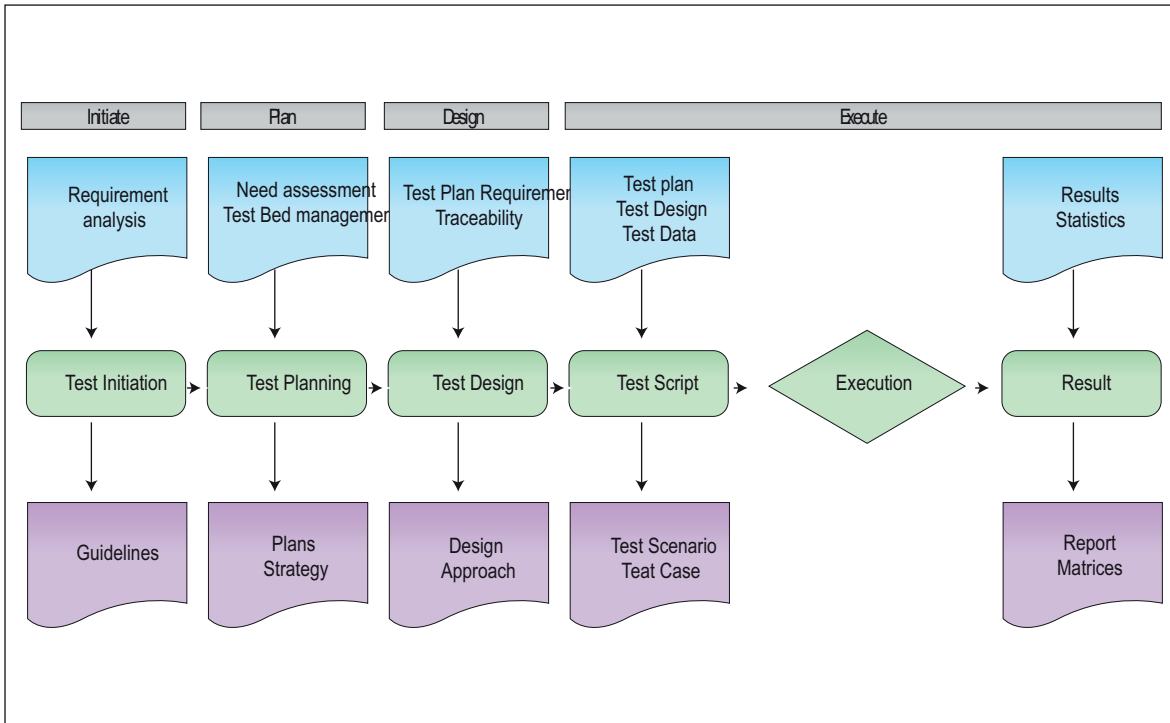


Figure 2: ICD-10 Testing- A Phased Approach

This type of testing can be done independently of each other and vertical testing. Once it succeeds, organizations can start with vertical testing. In practice, horizontal and vertical testing must be closely coordinated to be effective, but they do provide a basis on which the organization can orchestrate activities, teams and track progress. Such unified testing focuses on the validation of end-to-end transactional processing, connectivity and outcomes.

Challenges

Since ICD-10 implementation is a complex proposition, involving enterprise-wide changes that has deep and wide impact, ICD-10 testing is unlikely to be painless. There will be inherent and contextual challenges, which include:

Inherent Challenges

- System complexities - homegrown vs. third party and newly adopted
- Varied technology - legacy to modern, all catering to different functional areas through different platforms
- Availability of sufficient testing infrastructure
- Configuration and releases

Contextual Challenges

- Lack of resources well-versed with ICD-10 knowledge
- Multiple ongoing programs within the organization
- Volume of scenario to be created and tested across multiple areas
- Strategic direction to the organization's ICD-10 compliance.

However, with appropriate planning and testing as described in this paper, the implementation can be made relatively trouble-free.

Conclusion

This paper is an attempt to provide some guidelines on how organizations can approach ICD-10 testing. As this paper shows, the task is complex, requiring careful planning and co-ordination among vendors, trading partners and within the organization. The testing for ICD-10 promises to be much more substantial than the testing for NPI and 5010 put together. This is owing to various factors such as:

- Overarching impact of ICD-10 across process & systems
- Number of covered entity participants which are involved
- Current limitations of test environments in healthcare organizations

The above can be a hindrance in supporting a full-scale end-to-end testing, they need to be handled carefully. Since ICD codes play a key role in many business processes, it is recommended that thorough testing be done. Organizations can use this paper as a starting point and adapt as suitable for their situation.

About the authors

Dr Suman De, Senior Associate Consultant. Dr Suman is clinician with Masters in Healthcare Administration with over 5 years of experience in medicine and Healthcare domain. He comes with extensive insight on US Payer & Provider Industry. He is currently engaged as a domain expert in the iTransform Product development team. He has credits in authoring white papers & point of views related to HIPAA 5010 & ICD-10 transition. He is an active associate with AHIMA & WEDI SG for 5010 & ICD-10.

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