

# What Every Healthcare Professional should Know About Case Mix Index (CMI): A Guide to Understanding Complexity and Value in Patient Care

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## Abstract

The Case Mix Index (CMI) is a cornerstone metric in healthcare, quantifying patient complexity and resource intensity, with direct implications for hospital reimbursement and operational performance. Despite its importance, CMI and related financial metrics are not typically included in the specialty training or competency frameworks of healthcare professionals, particularly physicians, limiting their ability to align clinical practices with institutional objectives. This study highlights the foundational role of the Diagnosis-Related Group (DRG) system in CMI calculation and demonstrates how accurate documentation and coding effectively capture patient complexity. The research integrates quality improvement methodologies, such as the Plan-Do-Study-Act (PDSA) cycle, to drive CMI optimization. For instance, targeted interventions, including real-time documentation reviews, multidisciplinary team collaboration, and CDI specialist engagement, are shown to increase documentation accuracy and DRG alignment. It is critical for healthcare professionals to learn how CMI is calculated to understand the metrics fully, respond effectively, and implement improvements that reflect the true complexity of patient care. The study provides a structured framework that combines CDI programs, AI-driven technologies, and quality improvement methodologies, empowering healthcare professionals to address documentation gaps and enhance operational efficiency. By bridging this knowledge gap, the research emphasizes that optimizing CMI is not only an administrative task but a strategic imperative for achieving clinical excellence, value-based care, and financial sustainability.

**Keywords:** Every Healthcare, Professional, Case Mix Index (CMI), Understanding Complexity, Patient Care

## Introduction

Case Mix Index (CMI) is a cornerstone metric in modern healthcare, reflecting the complexity, severity, and resource intensity of patient care. By bridging clinical realities with operational

sustainability, CMI plays a critical role in hospital reimbursement systems, resource allocation, and benchmarking quality of care. Yet, for many healthcare professionals, the complexities of CMI remain puzzle. This article aims to explain the concept, exploring its foundations, implications, and strategies for optimization, drawing on evidence from healthcare systems globally.

One of the primary drivers for this article is the observation that many healthcare professionals are unfamiliar with CMI, as it is often not included in their formal training or competency frameworks. This gap in understanding creates challenges in aligning clinical practice with institutional goals, particularly in the context of evolving healthcare systems.

The foundation of the Case Mix Index (CMI) lies in the diagnosis-Related Group (DRG) system, a patient classification methodology developed at Yale University in the late 1960s. DRGs were designed to relate the type of patients a hospital treats to the costs incurred, thereby standardizing hospital payments and promoting efficiency. In 1983, the U.S. Congress implemented a prospective per-case payment system for Medicare patients based on DRGs to control the rising costs of hospital care (Böcking & Trojanus, 2008).

DRGs group patients based on similar diagnoses, procedures, and resource utilization. Each group is assigned a relative weight representing the average cost of care compared to a baseline. For example, a DRG weight of 1.5 indicates that cases in this group require 50% more resources than average (Chen et al., 2021). The accuracy of CMI depends on precise DRG assignment, which is driven by detailed clinical documentation and coding. Without capturing all relevant diagnoses, complications, and comorbidities, DRG weights—and consequently, CMI—may not reflect the true complexity of patient care (Zheng et al., 2024). For instance, failing to document secondary conditions such as malnutrition or sepsis in a pneumonia case can result in a lower-weighted DRG, underrepresenting the intensity of care provided and impacting hospital reimbursement (Kim et al., 2024).

Global healthcare systems demonstrate the transformative potential of DRGs. In Germany, the introduction of DRGs in 2004 enhanced resource efficiency by 20% over a decade while standardizing reimbursement practices (Boes et al., 2021). Similarly, reforms in Sichuan Province, China, combined DRGs with electronic health record (EHR) systems to improve CMI accuracy, reduce hospital stays, and lower costs (Zheng et al., 2024). In Abu Dhabi, the Health Authority of Abu Dhabi (HAAD) introduced DRGs as a mandatory payment model for inpatient services in 2010. This replaced the fee-for-service payment method, which was associated with inefficiencies and rising healthcare costs. Abu Dhabi's adoption of the International Refined DRG (IR-DRG) system aimed to incentivize hospitals to deliver cost-effective care while accurately reimbursing complex cases in public and private sectors. Evidence from HAAD's implementation highlights its impact on transparency, resource efficiency, and care quality, with significant improvements in comparative performance metrics across hospitals (Hamidi & Akinci, 2015; Warner et al., 2011). These examples underscore DRGs' capacity to balance financial sustainability with clinical outcomes when implemented effectively.

Beyond financial implications, CMI serves as a strategic indicator of hospital performance. A high CMI suggests a facility managing complex cases effectively, while a low CMI may signal gaps in documentation or coding rather than a lack of patient complexity (Chen et al., 2021;

Böcking & Trojanus, 2008; Yale University, 2019). For healthcare professionals, understanding and optimizing CMI is not merely an administrative task but a clinical responsibility, essential for aligning operational priorities with patient care excellence.

This article proceeds to explore the core elements of CMI, including the role of clinical documentation, coding accuracy, and multidisciplinary collaboration. By leveraging insights from global healthcare systems, it provides actionable strategies for healthcare professionals to enhance their understanding of CMI and its impact on hospital operations.

### *Understanding the Foundations of CMI*

Case Mix Index (CMI) is a crucial metric in healthcare that quantifies the average complexity and resource intensity of a hospital's patient population. It is derived from the Diagnosis-Related Group (DRG) system, which classifies hospital cases based on diagnoses, procedures, and anticipated resource utilization. A higher CMI signifies a more complex and resource-demanding patient mix, while a lower CMI suggests less complexity or potential documentation deficiencies. This metric is instrumental not only for reimbursement purposes but also as a benchmark for hospital performance, enabling leaders to assess the alignment between clinical complexity and operational objectives (Ren et al., 2024).

Imagine a hospital is like a car repair shop, and its Case Mix Index (CMI) reflects the complexity of the "repairs" it handles. Basic cases, like a routine oil change, represent lower-complexity patients with minimal resource needs, contributing to a lower CMI. On the other hand, major engine overhauls symbolize high-complexity cases, requiring specialized skills, time, and equipment, thereby raising the CMI. Just as a repair shop's workload and revenue depend on the mix of simple and complex jobs, a hospital's operations and financial sustainability rely on accurately documenting and reflecting its patient complexity through CMI.

### *From MDC to IR-DRG to Diagnosis and Procedure: The Building Blocks of CMI*

Before diving into the Case Mix Index (CMI), it is essential to understand the structured framework that supports its calculation. The CMI is built upon a hierarchical system starting with Major Diagnostic Categories (MDCs), progressing through International Refined Diagnosis-Related Groups (IR-DRGs), and incorporating individual diagnoses and procedures. Refer to Figure 1. This structure ensures clinical coherence, accurate resource allocation, and a fair reflection of hospital case complexity.

### *Major Diagnostic Categories (MDCs): The Starting Point*

MDCs are broad categories that group hospital cases based on organ systems or disease types. They serve as the foundation of the IR-DRG system, ensuring cases are organized in a clinically logical manner.

- **Purpose:**
  - To group patients with similar clinical and resource needs.
  - To align diagnoses and procedures with specific organ systems or disease types.
- **Examples of MDCs:**
  - **MDC 04:** Diseases and Disorders of the Respiratory System.
  - **MDC 05:** Diseases and Disorders of the Circulatory System.
  - **MDC 06:** Diseases and Disorders of the Digestive System.

### *International Refined Diagnosis-Related Groups (IR-DRGs): Specific Classification*

Within each Major Diagnostic Category (MDC), cases are further categorized into International Refined Diagnosis-Related Groups (IR-DRGs). IR-DRGs classify cases based on resource consumption and clinical similarity, ensuring fair reimbursement and accurate reflection of hospital case complexity. This makes IR-DRGs central to the calculation of the Case Mix Index (CMI) (Dubai Health Authority, 2015).

The term IR-DRG—International Refined Diagnosis-Related Groups—reflects its global standardization and refinement over earlier DRG systems. Originating from the Diagnosis-Related Groups (DRGs) concept developed in the United States in the 1980s, IR-DRGs evolved to address limitations of traditional DRGs by incorporating more detailed patient data, including SOI and ROM levels. This refinement allows for a more nuanced assessment of case complexity and resource utilization, making the system adaptable across different healthcare systems worldwide.

The "international" aspect of IR-DRGs signifies its adoption and application beyond the United States, where it has been tailored to meet the needs of various healthcare environments while maintaining a standardized framework (International Refined-DRGs (IR-DRGs) | 3M UAE, n.d.).

### **Key Components**

1. **Base IR-DRG Code:** Identifies the condition or procedure within the MDC.

2. **Severity of Illness (SOI) Levels:**

**Purpose:** SOI levels refine IR-DRG classification by assessing the complexity of a patient's condition and the resources required for care. It ranges from:

- SOI 1 (Minor): Simple cases with minimal resource needs.
- SOI 2 (Moderate): Moderate complexity with some complications or comorbidities (CCs).
- SOI 3 (Major): High complexity with significant complications or major comorbidities (MCCs).
- SOI 4 (Extreme): Critical cases requiring intensive and specialized care.

### **Risk of Mortality (ROM) Levels**

**Purpose:** ROM levels indicate the likelihood of patient mortality, complementing SOI levels to provide a holistic view of case severity. It ranges from :

- ROM 1 (Low): Minimal risk of mortality.
- ROM 2 (Moderate): Moderate risk of mortality.
- ROM 3 (Major): Significant risk of mortality.
- ROM 4 (Extreme): Very high likelihood of mortality, often life-threatening.

Together, SOI and ROM levels enhance the accuracy of IR-DRG classification, ensuring fair reimbursement and better resource alignment for varying case complexities.

### • **Example of IR-DRGs under MDC 05 (Circulatory System):**

- **IR-DRG 051401:** Percutaneous Cardiovascular Procedure with Minor SOI.
- **IR-DRG 051403:** Percutaneous Cardiovascular Procedure with Major SOI.

### *How to Read an IR-DRG Code*

An **IR-DRG Code** provides detailed classification of patient cases. Let's break down an example:

Code Segment	Description	Example
<b>05</b>	<b>Major Diagnostic Category (MDC):</b> Indicates the organ system or disease category.	<b>05 = Circulatory System</b>
<b>140</b>	<b>Base IR-DRG Code:</b> Specifies the type of procedure or condition within the MDC.	<b>140 = Percutaneous Cardiovascular Procedures</b>
<b>1 (6th digit)</b>	<b>Severity of Illness (SOI):</b> Represents the complexity or severity of the patient's condition.	<b>1 = Minor Severity</b>

**Example Code: 051401**

- **05:** Circulatory System.
- **140:** Percutaneous Cardiovascular Procedures.
- **1:** Minor Severity of Illness.

This code represents a relatively low-complexity cardiovascular procedure.

*From IR-DRG to Diagnosis and Procedure*

Each IR-DRG is informed by:

1. **Diagnoses:** The primary and secondary conditions affecting the patient.
2. **Procedures:** Interventions or treatments performed.

**Example:**

- **Diagnosis:** Acute Myocardial Infarction (AMI).
- **Procedure:** Coronary Angioplasty.

These details refine the IR-DRG assignment and influence its weight, which reflects the expected resource use.

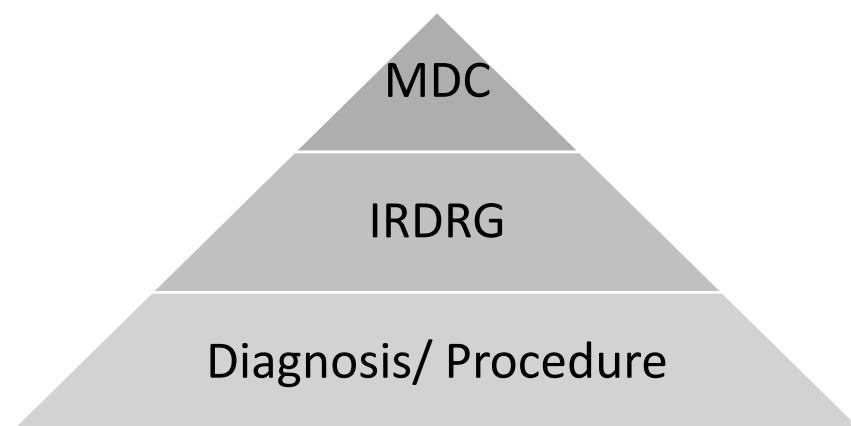


Figure 1 Hierarchical Structure from MDC to IR-DRG to Diagnosis/Procedure

*Building the Case Mix Index (CMI)*

The **CMI** is a hospital-level metric that reflects the average resource intensity of patient cases. It is calculated using IR-DRG weights:

**CMI=Sum of IR-DRG Weights for All Discharges/Total Number of Discharges.**

*Example CMI Calculation*

Case	MDC	IR-DRG	Description	SOI	ROM	IR-DRG Weight
1	MDC 04 (Respiratory)	040101	Simple Pneumonia	Minor	Low	0.6657
2	MDC 05 (Circulatory)	051403	Percutaneous Cardiovascular Procedure	Major	Moderate	2.9001
3	MDC 06 (Digestive)	060302	GI Bleed with Complications	Moderate	Low	1.4325
4	MDC 05 (Circulatory)	051401	Percutaneous Cardiovascular Procedure	Minor	Low	1.5323

1. **Sum of IR-DRG Weights:**

$$0.6657 + 2.9001 + 1.4325 + 1.5323 = 6.5306$$

2. **Total Number of Discharges:** 43. **CMI Calculation:**

$$\text{CMI} = \text{Sum of IR-DRG Weights} / \text{Total Discharges} = 6.5306 / 4 = 1.6327$$

*Important Note*

The IR-DRG weights provided in the example (e.g., 0.6657 for simple pneumonia or 2.9001 for cardiovascular procedures) are representative and intended for illustrative purposes. These weights may not reflect the most current or exact values used in official healthcare systems.

The progression from MDCs to IR-DRGs, incorporating individual diagnoses and procedures, forms the foundation of the Case Mix Index (CMI). This hierarchy ensures:

1. **Clinical Coherence:** Organizing cases based on shared characteristics.
2. **Resource Alignment:** DRG weights reflect the intensity of care.
3. **Operational Planning:** CMI helps hospitals optimize resources and assess performance.

By understanding this structured system, healthcare professionals can enhance resource management, improve reimbursement accuracy, and align operational strategies with patient care needs.

*Why CMI Matters*

CMI impacts hospitals in several critical ways:

1. **Financial Reimbursement:** In DRG-based payment systems, higher CMI results in greater reimbursement. Accurate CMI ensures that hospitals are compensated fairly for the resources used in patient care (Boes et al., 2021).
2. **Resource Allocation:** By reflecting case complexity, CMI helps hospitals allocate resources effectively, such as staff, equipment, and facilities.
3. **Benchmarking Performance:** CMI allows hospitals to compare their performance against peer institutions. For instance, a lower-than-expected CMI might indicate documentation gaps or inefficiencies in care delivery (Chen et al., 2021).

*Challenges in Achieving Accurate CMI*

While Case Mix Index (CMI) is a vital measure of hospital performance and reimbursement, achieving an accurate representation of case complexity is fraught with challenges. These

obstacles often stem from gaps in clinical documentation, coding errors, and inadequate multidisciplinary collaboration. Addressing these issues is essential to ensure that CMI accurately reflects the intensity of care provided and supports operational and financial sustainability.

#### *Documentation Gaps*

Accurate CMI calculations depend heavily on thorough and specific clinical documentation. However, vague or incomplete records can lead to underrepresentation of case complexity. For example, a patient admitted with pneumonia who develops sepsis may not have the latter condition documented due to oversight, resulting in a lower-weighted DRG assignment. Similarly, conditions like malnutrition or chronic kidney disease often go undocumented, despite their significant impact on care intensity and resource use (Chen et al., 2021; Zheng et al., 2024).

Studies have shown that poor documentation practices not only reduce CMI but also hinder hospitals' ability to secure adequate resources. In Sichuan Province, China, the implementation of DRG reforms revealed widespread documentation gaps that, when addressed, significantly increased CMI and improved hospital reimbursement (Zheng et al., 2024).

#### *Coding Errors*

Accurate coding is critical for translating clinical documentation into appropriate DRG assignments. However, errors in coding—such as misclassification of conditions or failure to capture complications—can distort DRG weights and, consequently, CMI. For instance:

- A coder might classify “kidney failure” generically, overlooking whether it is acute or chronic, which directly affects DRG weight.
- Missing secondary diagnoses, such as diabetes or heart failure, may result in a lower SOI score, undervaluing the complexity of care provided (Boes et al., 2021).

Training and ongoing education for coders and CDI specialists are essential to mitigate these errors and ensure that coding accurately reflects the documented clinical reality.

#### *Siloed Collaboration*

Collaboration between clinicians, CDI specialists, and coders is critical to achieving accurate CMI. However, siloed workflows often hinder effective communication and alignment. Physicians may view documentation as an administrative burden, while coders may lack clinical context to interpret ambiguous records. This disconnect can result in missed opportunities to capture case complexity fully (Chen et al., 2021).

Multidisciplinary collaboration, such as regular meetings between CDI teams and clinical departments, has been shown to improve documentation and coding accuracy. For example, oncology units that held weekly case reviews with CDI specialists saw significant increases in documented comorbidities like neutropenia and malnutrition, leading to higher DRG weights and CMI (Zheng et al., 2024).

### *Resistance to Change*

Physicians juggle multiple responsibilities, including patient care, research, education, and administrative tasks, often leaving limited time for coding and documentation. This can result in incomplete documentation, negatively impacting the Case Mix Index (CMI) and reimbursements. Introducing coders on the floor and conducting rapid reviews from the first day of admission can significantly improve Diagnosis-Related Group (DRG) accuracy.

However, resistance to change is a common barrier. Physicians often cite time constraints and administrative overload as reasons for hesitating to adopt improved documentation practices (Apathy et al., 2024). Addressing this resistance requires educating clinicians on the financial and operational importance of accurate documentation and demonstrating its benefits, such as better resource management and reduced workload. Providing dedicated time for documentation and coder support can further ease the burden and enhance compliance (Boes et al., 2021).

### *Technological Challenges*

While technology can aid in documentation and coding, its implementation is not without challenges. EHR systems with CDI prompts and real-time alerts are powerful tools but require significant investment and training. Additionally, reliance on automation without human oversight can lead to errors in interpreting complex clinical scenarios, further complicating DRG assignment (Chen et al., 2021).

### *Operational Impact of Inaccurate CMI*

An inaccurate CMI not only affects financial outcomes but also undermines hospital benchmarking and resource planning. For example:

- A low CMI might result in reduced reimbursement, limiting the hospital's ability to invest in advanced technologies or hire specialized staff.
- Misrepresentation of case complexity can distort quality metrics, affecting the hospital's reputation and competitive positioning.

In Germany, hospitals that implemented robust CDI programs alongside DRG reforms demonstrated that accurate CMI is crucial for sustaining operational and financial performance (Boes et al., 2021).

### *Case Mix Index (CMI) and Financial Stability*

The Case Mix Index (CMI) is a measure of the complexity and resource intensity of the patient population a hospital treats. A higher CMI indicates that the hospital is managing more severe or complicated cases, which often require advanced medical technology, specialized staff, and extended care. This leads to increased patient care costs. Although a high CMI typically results in higher reimbursements under systems like Diagnosis-Related Groups (DRGs), these reimbursements must adequately cover the elevated costs associated with complex care.

For example, a hospital specializing in complex spinal surgeries might see a high CMI because of the intricate procedures performed. However, if reimbursements do not fully align with the actual costs incurred, the hospital could face financial difficulties. Accurate documentation and coding are critical to ensuring proper CMI calculations and appropriate reimbursement levels. Failure to achieve this balance can threaten the hospital's financial stability (Adonis Content Team, 2024).



### *Strategies for Optimizing CMI*

Optimizing Case Mix Index (CMI) requires a multifaceted approach that integrates clinical documentation improvement (CDI) programs, technology, collaboration, and education. By addressing gaps in documentation and coding practices while fostering a culture of collaboration, healthcare organizations can ensure that CMI accurately reflects patient complexity and supports operational and financial goals.

### *Clinical Documentation Improvement (CDI) Programs*

CDI programs are at the heart of CMI optimization, ensuring that clinical documentation captures the full scope of patient complexity. These programs bridge the gap between physicians and coders, enhancing the accuracy of DRG assignments.

- **Real-Time Documentation Reviews:** CDI specialists conduct real-time reviews of patient records, identifying documentation gaps and sending timely queries to physicians. For example, a CDI specialist may query a physician to clarify whether a patient's "infection" meets the criteria for sepsis, which can significantly impact the DRG weight (Chen et al., 2021).
- **Education for Physicians:** Regular workshops and training sessions equip physicians with the knowledge to document conditions like malnutrition or acute kidney injury accurately. For instance, distinguishing between "malnutrition" and "severe malnutrition" can increase the DRG weight, reflecting the true resource intensity (Boes et al., 2021).
- **Performance Metrics:** CDI programs monitor query response rates, missed secondary diagnoses, and the impact of documentation changes on DRG weights to identify opportunities for further improvement.

### *Leveraging Technology*

Technology is a powerful enabler in optimizing CMI, streamlining the documentation and coding processes while reducing the risk of errors.

- **EHR Integration:** Modern EHR systems include CDI prompts that alert physicians to missing diagnoses or incomplete documentation before patient discharge. For example, an alert might remind a physician to document secondary conditions like chronic kidney disease or malnutrition (Zheng et al., 2024).
- **Artificial Intelligence (AI):** AI-driven tools analyze patient records to identify documentation gaps and suggest potential comorbidities or complications. For instance, AI can flag cases where a diagnosis of sepsis might be missing based on clinical indicators such as elevated lactate levels or abnormal vital signs (Kim et al., 2024).
- **Data Dashboards:** Real-time dashboards visualize trends in DRG weights, CMI, and query resolution rates, enabling leadership to make data-driven decisions and track the impact of CDI efforts.

### *Multidisciplinary Collaboration*

CMI optimization is a collaborative effort that requires input from clinicians, CDI specialists, coders, and administrators. Breaking down silos between these groups fosters alignment and enhances the accuracy of documentation and coding.

- **Interdisciplinary Rounds:** Regular rounds involving physicians, CDI specialists, and coders help address documentation issues in real-time. For example, during a case discussion, a CDI specialist might clarify the need to document complications like respiratory failure or acute kidney injury (Chen et al., 2021).

- **Cross-Departmental Task Forces:** Creating task forces that include representatives from key departments, such as ICU or oncology, allows for tailored solutions to department-specific challenges in documentation and coding.
- **Feedback Mechanisms:** Establishing feedback loops where CDI specialists and coders share documentation insights with clinicians promotes continuous learning and improvement.

#### *Education and Engagement*

Engaging healthcare professionals in the importance of CMI and its implications for hospital operations is essential for sustained improvement.

- **Physician Engagement:** Demonstrating the link between documentation practices and resource allocation helps physicians understand the broader impact of their work. For example, showing how accurate documentation secures funding for advanced technologies or specialized staff can motivate change (Boes et al., 2021).
- **CDI Team Training:** Continuous education for CDI specialists and coders ensures that they stay updated on coding guidelines and best practices. For example, understanding the nuances of ICD-10 coding can significantly enhance DRG accuracy.

#### *Using Data to Drive Improvement*

Data analytics play a critical role in identifying opportunities for CMI optimization and tracking the impact of interventions.

- **Outlier Analysis:** Reviewing cases with unusually low or high DRG weights helps identify documentation gaps or coding errors. For example, a sudden drop in CMI for a department might indicate missed secondary diagnoses or incomplete documentation (Zheng et al., 2024).
- **Benchmarking:** Comparing CMI performance against peer institutions highlights areas for improvement and sets achievable goals for optimization.
- **Trend Monitoring:** Tracking CMI trends over time enables leadership to assess the effectiveness of CDI initiatives and adjust strategies as needed.

#### *Sustaining CMI Improvements*

Sustaining CMI improvements requires continuous monitoring, education, and leadership support. By embedding best practices into daily workflows and fostering a culture of collaboration, hospitals can ensure long-term success in aligning financial and clinical outcomes.

#### *Measuring and Monitoring CMI: Key Metrics and Insights*

To sustain improvements and ensure that Case Mix Index (CMI) reflects the true complexity of care, healthcare organizations must prioritize regular measurement and monitoring. This involves tracking key performance indicators (KPIs), analyzing trends, and using data-driven insights to guide strategic decisions.

#### *Key Metrics for CMI Monitoring*

CMI monitoring hinges on identifying meaningful metrics that reflect documentation accuracy, coding efficiency, and case complexity. Below are some of the essential KPIs:

1. **DRG Accuracy Rates:**

- **Definition:** The percentage of correctly assigned DRGs based on clinical documentation and coding reviews.
- **Purpose:** Ensures DRG assignments align with patient complexity and prevents under- or over-reporting of resource use.
- **Example:** A hospital achieves a DRG accuracy rate of 95%, reflecting robust documentation and coding practices.

2. **SOI and ROM Distribution:**

- **Definition:** Tracks the distribution of Severity of Illness (SOI) and Risk of Mortality (ROM) levels across the organization.
- **Purpose:** Identifies under-documented cases where SOI and ROM are not accurately captured.
- **Example:** A sudden drop in SOI Level 3 cases in the ICU might indicate documentation gaps for conditions like sepsis or acute kidney injury.

3. **Query Response Rates:**

- **Definition:** Measures the percentage of physician responses to CDI or coding queries.
- **Purpose:** Monitors clinician engagement in the documentation improvement process.
- **Example:** A department with a response rate of 80% may require additional training to improve query completion times.

4. **Average CMI by Department or Specialty:**

- **Definition:** Tracks the average CMI for specific departments or specialties.
- **Purpose:** Highlights variations in case complexity and identifies areas for improvement.
- **Example:** The oncology department reports an average CMI of 2.0, while the benchmark for similar institutions is 2.5.

5. **Financial Impact Metrics:**

- **Definition:** Tracks additional revenue generated through documentation and coding improvements.
- **Purpose:** Quantifies the return on investment (ROI) of CDI initiatives.
- **Example:** A hospital realizes a \$500,000 annual increase in reimbursement after improving documentation for SOI Level 3 cases.

*Analyzing Trends and Variations*

Analyzing trends in CMI metrics helps healthcare leaders identify patterns and variations that can inform improvement strategies.

• **CMI Trends Over Time:**

- Weekly, monthly, or quarterly tracking of CMI reveals whether interventions are driving improvements. For instance, a gradual rise in CMI after implementing real-time CDI prompts indicates success.

• **Outlier Identification:**

- Analyzing cases with unusually high or low DRG weights highlights documentation or coding discrepancies.
- Example: A department with a sudden drop in DRG weights might have unaddressed gaps in documenting comorbidities.

*Using Data to Drive Decision-Making*

Leadership can leverage CMI data to implement targeted interventions and allocate resources effectively. Visual dashboards play a critical role in translating data into actionable insights.

- **Data Visualization:**
  - Dashboards that visualize DRG weights, CMI trends, and SOI/ROM distributions enable real-time monitoring.
  - Filters by department, specialty, or physician allow for granular analysis and prioritization.
- **Benchmarking:**
  - Comparing performance with peer institutions helps set achievable goals and identify best practices.
- **Strategic Alignment:**
  - Using CMI data to inform budgeting, staffing, and technology investments ensures alignment with organizational objectives.

Effective CMI monitoring not only improves financial outcomes but also enhances operational efficiency and patient care quality. By identifying gaps and implementing data-driven solutions, hospitals can achieve a balance between clinical excellence and financial sustainability.

### **Case Scenario: Before and After Improvement in CMI**

#### *Background*

For illustrative purposes only. Consider this example: An oncology hospital observed a significant decline in its Case Mix Index (CMI) from 1.7 to 1.5 over six months. This drop, hypothetically attributed to under-documentation of patient complexity, missed secondary diagnoses such as malnutrition, and low query response rates, could jeopardize the hospital's financial stability and operational benchmarks. In such a scenario, leadership might recognize the need for targeted interventions to address these issues

#### *Interventions*

To address the identified gaps, the hospital implemented the following interventions, each requiring 4–5 Plan-Do-Study-Act (PDSA) cycles for full integration:

1. **Focused Documentation Training:** Delivered regular training sessions for physicians to improve the documentation of conditions like malnutrition and febrile neutropenia.
2. **CDI and Coder MDT Participation:** Required Clinical Documentation Improvement (CDI) specialists and coders to attend multidisciplinary team (MDT) meetings for real-time input and case discussion.
3. **Query Turnaround Time Protocol:** Established a 48-hour resolution window for CDI queries. Queries unresolved within this timeframe were escalated first to the department chair, then to senior management.
4. **Weekly Data Transparency:** Posted weekly CMI trends, query response rates, and DRG performance metrics on quality boards for healthcare provider communication.
5. **Real-Time CDI Prompts:** Enhanced EHR systems with alerts to flag potential documentation gaps during patient encounters.

#### *Before Improvement*

- **Documentation Gaps:** Physicians often failed to document secondary diagnoses like "malnutrition" or "neutropenia," leading to DRG assignments that underestimated resource use and complexity.
- **Query Issues:** Only 60% of CDI queries were addressed within the required timeframe, resulting in incomplete documentation.

- **Coding Errors:** A lack of specificity in clinical records led to coding errors. For instance, a patient treated for sepsis secondary to chemotherapy complications was coded under a general infection DRG (weight: 0.8) instead of a higher-complexity oncology DRG (weight: 1.8).
- **Siloed Efforts:** Limited collaboration between CDI teams, coders, and clinicians exacerbated these challenges, leaving critical gaps unaddressed.

#### *After Improvement*

- **Enhanced Documentation:** Targeted training and CDI participation in rounds ensured that conditions such as "severe protein-calorie malnutrition" and "febrile neutropenia with sepsis" were consistently documented.
- **Increased Query Response Rates:** Response rates improved from 60% to 90% due to streamlined escalation processes and real-time feedback mechanisms.
- **Accurate Coding:** Coders were able to assign higher-weighted DRGs accurately, aligning documentation with patient complexity. For example:
  - Before: A case of sepsis post-chemotherapy was assigned a low DRG weight of 0.8.
  - After: With clarified documentation, the DRG weight increased to 1.8, reflecting the true complexity.
- **Collaborative Culture:** Weekly MDT meetings and transparent reporting fostered alignment across departments, improving engagement and accountability.

#### *Outcomes*

- **CMI Improvement:** The hospital's CMI increased from 1.5 to 1.9 within six months, approaching the national oncology benchmark of 2.2.
- **Revenue Growth:** Improved documentation and coding practices led to a 15% increase in reimbursement, allowing reinvestment in critical resources.
- **Clinician Engagement:** Physician buy-in improved, with 85% reporting a clearer understanding of the importance of accurate documentation to hospital performance.

#### **Recommendations**

To optimize the Case Mix Index (CMI), healthcare organizations should integrate education, robust CDI programs, technology, and multidisciplinary collaboration into their operational workflows. Training healthcare professionals on the importance of CMI and its role in reflecting patient complexity is essential. Strengthening Clinical Documentation Improvement (CDI) programs, supported by real-time reviews and queries, can bridge gaps between clinical documentation and coding. Leveraging advanced technology, such as AI and CDI-enabled electronic health records (EHRs), ensures efficient identification and correction of documentation gaps.

Data monitoring through dashboards can help track trends in DRG performance and CMI across departments and specialties, providing actionable insights for improvement. Collaboration among clinicians, CDI specialists, and coders, facilitated through regular multidisciplinary team (MDT) meetings, ensures comprehensive case reviews and accurate documentation. Implementing timely query resolution protocols, such as a 48-hour turnaround, enhances accountability and ensures prompt actions to address documentation gaps.

Recognizing the financial and operational implications of CMI can motivate healthcare professionals to align clinical practices with institutional goals, ensuring accurate representation of case complexity and resource needs.

### **Conclusion**

The Case Mix Index (CMI) is a critical measure linking clinical complexity to operational and financial sustainability in healthcare. By addressing documentation gaps, fostering collaboration, and utilizing technology, hospitals can ensure that CMI reflects the true intensity of care provided. Accurate CMI enhances reimbursement, informs resource allocation, and benchmarks hospital performance. Optimizing CMI is not just an administrative necessity but a strategic and clinical responsibility essential for value-based healthcare. Through collective efforts and strategic alignment, healthcare organizations can achieve both financial sustainability and clinical excellence.

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