Computer Assisted Coding software is evolving platforms that are useful for hospitals, clinical facilities, and physician office groups seeking to achieve excellence and repeatability in billing and workflow management.

# Computer Assisted Coding: Executive Summary

The study is designed to give a comprehensive overview of the Computer Assisted Coding software market segment. Research represents a selection from the mountains of data available of the most relevant and cogent market materials, with selections made by the most senior analysts. Commentary on every aspect of the market from independent analysts creates an independent perspective in the evaluation of the market. In this manner the study presents a comprehensive overview of what is going on in this market, assisting managers with designing market strategies likely to succeed.

## Table of Contents

- Computer Assisted Coding Executive Summary
  - Medical Best Practice Linking
  - CAC for Coders
  - Computer Assisted Coding Best Practice
  - Coding Solutions
  - Physician Computer Assisted Coding Services
- Natural Language Computer Assisted Coding Market Shares
- Natural Language Computer Assisted Coding of Medical Procedures Forecasts
- Medical Best Practice Linking
1. Computer Assisted Coding Market Description and Market Dynamics 34

1.1 Coding Challenge 34
1.1.1 Computer Assisted Coding (CAC) 34
1.1.2 Advances In Natural Language Processing And Informatics 36
1.1.3 Using Electronic Health Record (EHR) Documentation To Generate Codes 37

1.2 Computer-Assisted Coding 38
1.2.1 Physician Practice Industry Forces Affecting Development of CAC 39
1.2.2 Application of CAC Technology 41

1.3 Development of a CAC Tool For Hospital Inpatient Use 42
1.3.1 CAC Impact on the Coding Workflow 42
1.3.2 Computers Replace Human Coders 42
1.3.3 CAC Applied Without Human Intervention Depends On Critical Differences Between CAC Systems 43

1.4 Healthcare Industry Largest In United States 44
1.4.1 Building a Safer Health System 46
1.4.2 Facilitating the Use of Technology in the Healthcare Industry 47
1.4.3 Prescription Drug Modernization 48

1.5 Medical Necessity and Medical Necessity Errors 49

1.6 Physician Office Electronic Coding 50
1.6.1 CAC Automates and Accelerates Auditing 54

1.7 Natural Language Solutions 54
1.7.1 State Of Language Technology Evaluation 55

1.8 Computerized Workflow System 57
1.8.1 Confidence Assessment Module 58
1.8.2 Researching Electronic Coding Products: 60
# 2. Computer Assisted Coding Market Shares and Forecasts

61

2.1.1 Medical Best Practice Linking 64
2.1.2 CAC for Coders 64
2.1.3 Computer Assisted Coding Best Practice 67
2.1.4 Coding Solutions 69
2.1.5 Physician Computer Assisted Coding Services 71

2.2 Natural Language Computer Assisted Coding Market Shares 72
2.2.1 3M 75
2.2.2 3M 77
2.2.3 3M Merging Quality With Reimbursement 80
2.2.4 Optum 81
2.2.5 Optum Automated Code Identification 82
2.2.6 Optum 85
2.2.7 nThrive / Precyse 86
2.2.8 Dolbey 86
2.2.9 McKesson 88
2.2.10 Cerner 90
2.2.11 TruCode 90

2.3 Natural Language Computer Assisted Coding of Medical Procedures Forecasts 90
2.3.1 CAC Market Software and Services Segmentation 94
2.3.2 CAC Hospitals and Facilities and Physicians Market Segment 96
2.3.3 Computer Assisted Coding Physician Market 98
2.3.4 Worldwide Computer Assisted Coding, Hospitals and Facilities and Physicians 100
Computer Assisted Coding Table of Contents
and List of Tables and Figures

2.3.5 CAC Software Market Hospital and Physician Segments 102
2.3.6 CAC Services Market Segment 103
2.3.7 US Computer Assisted Coding Physician Software License /
   Maintenance and Cloud SaaS Services 104
2.3.8 Physicians Computer Assisted Coding 107
2.3.9 US Computer Assisted Coding Software Units 110
2.3.10 US Computer Assisted Coding Software / Cloud Services for
   Independent Radiology Clinics Market Forecasts 112
   2.3.1 US Independent Radiology Imaging Centers 113
   2.3.2 Erroneous Selection of Principal Diagnoses Impacting Reimbursement
       114
   2.3.3 Growth of the U.S. Healthcare Industry 118

2.4 Worldwide, Number of Patients and Procedures 120
2.5 Making The Shift To The Modern ICD-10 Requirements 124
2.6 Computer Assisted Coding Prices 125
2.7 Computer Assisted Coding Regional Analysis 126
   2.7.1 3M 360 Encompass System 129

3. Computer Assisted Coding Product Description 130
3.1 3M 130
   3.1.1 3M 360 Encompass System 131
   3.1.2 3M 3M CodeAssist System 133
   3.1.3 3M APR DRG Solutions Aspects 139
   3.1.4 3M Merging Quality With Reimbursement 140
   3.1.5 3M™ APR DRG Software 142
   3.1.6 3 M Classification System For Patients 142
   3.1.7 3M APR DRG Software Features:
| 3.1.8  | 3M Coding Technology | 147 |
| 3.1.9  | 3M Computer-Assisted Coding Solutions | 148 |
| 3.1.10 | 3M Medical Coding Tools Streamline Processes | 148 |
| 3.1.11 | CodeAssist Automating the Medical Coding Process | 149 |
| 3.1.12 | 3M CodeComplete Outsource Solution for Medical Coding | 150 |
| 3.1.13 | 3M DataScout Clinical Data Extraction and Identification | 150 |
| 3.1.14 | 3M and American Academy of Professional Coders (AAPC) | 152 |
| 3.1.15 | 3M Data Mining Technology | 153 |
| 3.1.16 | 3M Systems for Overcoming Documentation Shortfalls | 154 |
| 3.1.17 | 3M Solutions for a Changing Healthcare Landscape | 158 |
| 3.1.18 | 3M Web-Based Coding Software Return on Investment | 171 |
| 3.1.19 | 3M Coding Software Functions | 173 |
| 3.1.20 | 3M Computer-Assisted Coding Solutions Targeted to Specialty Areas | 175 |
| 3.1.21 | 3M CodeAssist Functions | 176 |
| 3.1.22 | 3M CodeComplete Business Process Management | 177 |
| 3.2   | Dolbey | 179 |
| 3.2.1 | Dolbey Coding Productivity Management | 181 |
| 3.2.2 | Dolby Fusion Suite Modules | 183 |
| 3.3   | Optum Coding Service | 187 |
| 3.3.1 | Optum Coding | 188 |
| 3.3.2 | Optum CPT® Codes | 189 |
| 3.3.3 | Optum Medicare Fee Schedule | 189 |
| 3.4   | McKesson | 191 |
| 3.4.1 | Mckesson Watching the Cash | 192 |
| 3.4.2 | McKesson Securing the Subsidy | 193 |
### Computer Assisted Coding Table of Contents

<table>
<thead>
<tr>
<th>Section</th>
<th>Title</th>
<th>Page</th>
</tr>
</thead>
<tbody>
<tr>
<td>3.4.3</td>
<td>McKesson Quality Control And Process Improvement</td>
<td>195</td>
</tr>
<tr>
<td>3.5</td>
<td>Cerner Computer Assisted Coding</td>
<td>196</td>
</tr>
<tr>
<td>3.6</td>
<td>Platocode® Computer-Assisted Coding</td>
<td>199</td>
</tr>
<tr>
<td>3.6.1</td>
<td>Platocode ICD 10</td>
<td>202</td>
</tr>
<tr>
<td>3.6.2</td>
<td>Platocode® Solution For Ambulatory Surgery</td>
<td>202</td>
</tr>
<tr>
<td>3.6.3</td>
<td>Platocode® API</td>
<td>203</td>
</tr>
<tr>
<td>3.6.4</td>
<td>Communication Between 3rd-Party Applications And A Platocode Server</td>
<td>203</td>
</tr>
<tr>
<td>3.7</td>
<td>Nuance Computer Assisted Coding</td>
<td>203</td>
</tr>
<tr>
<td>3.7.1</td>
<td>Nuance Clinical Documentation Review</td>
<td>204</td>
</tr>
<tr>
<td>3.7.2</td>
<td>Nuance Clinical Documentation Compliance</td>
<td>205</td>
</tr>
<tr>
<td>3.7.3</td>
<td>Nuance Clintegrity Computer Assisted Coding (CAC)</td>
<td>205</td>
</tr>
<tr>
<td>3.7.4</td>
<td>Nuance Clintegrity Computer Assisted Coding (CAC) Key Features</td>
<td>208</td>
</tr>
<tr>
<td>3.7.5</td>
<td>Nuance Clintegrity Facility Coding Solutions for Healthcare</td>
<td>208</td>
</tr>
<tr>
<td>3.7.6</td>
<td>Nuance Clintegrity Facility Coding</td>
<td>210</td>
</tr>
<tr>
<td>3.7.7</td>
<td>Nuance Clintegrity Computer Assisted Coding (CAC) Features</td>
<td>211</td>
</tr>
<tr>
<td>3.7.8</td>
<td>Nuance Clintegrity Physician Coding</td>
<td>212</td>
</tr>
<tr>
<td>3.7.9</td>
<td>Nuance Clinician Reimbursement Calculation</td>
<td>214</td>
</tr>
<tr>
<td>3.7.10</td>
<td>Nuance Clintegrity Compliance &amp; ICD-10 Transition</td>
<td>215</td>
</tr>
<tr>
<td>3.7.11</td>
<td>Nuance Clintegrity Facility Coding</td>
<td>216</td>
</tr>
<tr>
<td>3.7.12</td>
<td>Nuance Clintegrity Abstracting</td>
<td>216</td>
</tr>
<tr>
<td>3.7.13</td>
<td>Nuance Clintegrity ICD-10 Education Services</td>
<td>218</td>
</tr>
<tr>
<td>3.7.14</td>
<td>Nuance Automated Coding</td>
<td>221</td>
</tr>
<tr>
<td>3.7.15</td>
<td>Nuance Natural Language Processing</td>
<td>222</td>
</tr>
<tr>
<td>3.7.16</td>
<td>Nuance Natural Language Understanding</td>
<td>222</td>
</tr>
</tbody>
</table>
### Computer Assisted Coding Table of Contents

#### 3.7.17 Nuance Mapping and Modeling Disparate Controlled Medical Vocabularies (CMVs); 223

#### 3.8 Artificial Medical Intelligence Emscribe CAC 223
   - 3.8.1 Artificial Medical Intelligence EMscribe Dynamic Search 225
   - 3.8.2 Artificial Medical Intelligence EMscribe Encoder 226
   - 3.8.3 AMI EMscribe® Dynamic Medical Term And Coding Search Tool 227
   - 3.8.4 Artificial Medical Intelligence Autonomous Coding 228
   - 3.8.5 Artificial Medical Intelligence (AMI) EMscribe Dx 229

#### 3.9 CodeCorrect 232
   - 3.9.1 CodeCorrect Capture Revenue and Maintain Compliance 232
   - 3.9.2 CodeCorrect knowledge 232
   - 3.9.3 CodeCorrect Medical Necessity Verification and APC Performance Tools 233
   - 3.9.4 QuadraMed 234

#### 3.10 M*Modal Coding 234
   - 3.10.1 M*Modal Workflow 236
   - 3.10.2 M*Modal Management Tools 236
   - 3.10.3 M*Modal Single Platform 236

#### 3.11 nThrive / MedAssets-Precyse and Equation 237
   - 3.11.1 Precyse Medical Coding and Computer Assisted Coding 237

### 4. Computer Assisted Coding Research and Technology 240

#### 4.1 Computer-Assisted Coding Technology 240

#### 4.2 Hybrid Technology 244
   - 4.2.1 Computer Assisted Coding Engine 244

#### 4.3 Optum Computer Assisted Coding Technology 246
4.4 Preventable Medical Conditions 247
4.5 Natural Language Processing (NLP) Medical Coding 248
  4.5.1 Rules Based Approaches 248
  4.5.2 Reports Based On Statistics 248
  4.5.3 Normalize the Data 249
4.6 Reports Must Be In Some Kind Of Electronic Format 249
  4.6.1 NLP Software Statistical Analysis 250
  4.6.2 Workflow 250
  4.6.3 Feedback for Machine Learning 250
  4.6.4 Coding 251
  4.6.5 Accuracy And Specificity Of Retrieval 252
  4.6.6 Natural Language Programming (NLP) Vocabulary Processor 252
  4.6.7 Robust Underlying Terminological Model And A Component Architecture 253
4.7 TeSSI® (Terminology Supported Semantic Indexing) 254
  4.7.1 L&C’s LinkBase® Medical Ontology 254
  4.7.2 Semantic Indexing With The TeSSI® Indexing Engine 255
  4.7.3 Semantic Indexing Solution Automates The Indexing Process 256
  4.7.4 Information Extraction with TeSSI® Extraction Engine 259
  4.7.5 Semantic Search with TeSSI® Search Engine 260
5. Computer Assisted Coding Company Profiles 261
  5.1 CAC Key Market Players 261
  5.2 3M 262
    5.2.1 3M Business 263
    5.2.2 3M Health Care Segment 266
    5.2.3 3M Electronics and Energy Business 267
5.2.4 3M Health Information Systems  

5.3 Artificial Medical Intelligence  

5.4 Cerner  
5.4.1 Cerner Business  
5.4.2 Cerner Acquired Siemens Health Services  
5.4.3 Cerner 2016 Fourth Quarter and Full-Year Highlights:  

5.5 Craneware  

5.6 Dolbey  

5.7 EPIC  

5.8 Group One / CodeCorrect  

5.9 M*Modal  

5.10 nThrive  
5.10.1 nThrive / Precyse  

5.11 Nuance  
5.11.1 Nuance Healthcare  
5.11.2 Nuance Business Description  
5.11.3 Nuance Key Metrics  
5.11.4 Nuance Healthcare Trends  

5.12 Quest Diagnostics  

5.13 TruCode  

5.14 UnitedHealth Group / Optum  
5.14.1 UnitedHealth Group / Optum  
5.14.2 UnitedHealth Group Optum Health Information Technology Acquires Clinical Data Analytics Vendor Humedica  
5.14.3 Optum Acquires Physician Practice Management And Revenue Management Software Firm, MedSynergies and Support
Computer Assisted Coding Table of Contents

and List of Tables and Figures

Arm of ProHealth Physicians Group 286

5.14.4 Optum MedSynergies Synergies 289

5.14.5 Optum Life Sciences 291

5.14.6 United Healthcare Revenue 292

5.15 Selected CAC Companies

WinterGreen Research, 295

WinterGreen Research Methodology 296

List of Figures

Figure 1. Computer Assisted Coding of Medical Information
Market Driving Forces 19

Figure 2. Computer Assisted Coding of Medical Information
Market Driving Factors 20

Figure 3. CAC Workstation Coder Benefits 22

Figure 4. CAC Management Tools 23

Figure 5. ELECTRONIC CODING SOLUTION MARKET DRIVING FORCES 27

Figure 6. ELECTRONIC CODING PRODUCT ISSUES 28

Figure 7. Computer Assisted Coding Software and Services Market Shares,
Dollars, 2016 30

Figure 8. Computer Assisted Coding Market Forecast, Dollars,
Worldwide, 2017-2024 32

Figure 9. Barriers to CAC 41

Figure 10. Electronic Coding Integrated Database Issues 51

Figure 11. Medical Necessity Online 52

Figure 12. Physician Office Computer Assisted Coding Key Benefits: 53
Figure 13. Natural Language Solutions System For Coding 55
Figure 14. Computerized Workflow System Systems Features 57
Figure 15. 3M Confidence Assessment Module System 59
Figure 16. Computer Assisted Coding of Medical Information  
Market Driving Forces 62
Figure 17. Computer Assisted Coding of Medical Information 
Market Driving Factors 63
Figure 18. CAC Workstation Coder Benefits 65
Figure 19. CAC Management Tools 66
Figure 20. ELECTRONIC CODING SOLUTION MARKET DRIVING FORCES 70
Figure 21. ELECTRONIC CODING PRODUCT ISSUES 71
Figure 22. Computer Assisted Coding Software and Services Market Shares, Dollars, 2016 73
Figure 23. Worldwide Computer Assisted Coding License Shipments and Cloud Services Market Shares, Dollars, 2016 74
Figure 24. 3M CAC Research Areas 76
Figure 25. 3M Core of NLP Computer Assisted Coding 78
Figure 26. Optum CAC Key Benefits: 82
Figure 27. Optum LifeCode®, CAC Functions 83
Figure 28. Optum LifeCode®, CAC Reconciliation Functions 84
Figure 29. Optum CAC Reconciliation Module Functions: 85
Figure 30. Platocode® Computer Assisted Coding Solution Benefits 88
Figure 31. Computer Assisted Coding Market Forecast, Dollars, Worldwide, 2017-2024 92
Figure 32. Computer Assisted Coding CAC Market Forecasts, Dollars, 2017 to 2023 93
Figure 33. CAC Market Segments Software and Services Key Topics 95
Figure 34. Worldwide Computer Assisted Coding Hospitals and Facilities and Physicians Market Shares, Dollars, 2016 96
Figure 35. Worldwide Computer Assisted Coding: Large Teaching Hospitals, Mid-Size and Small Hospitals, and Clinical Facilities, Market Shares, Units, 2016 97
Figure 36. Worldwide Computer Assisted Coding, Hospitals and Facilities and Physicians, Market Shares, Units, 2016 100
Figure 37. Worldwide Computer Assisted Coding, License Shipments, Services, and Cloud Services 101
Figure 38. Worldwide and US Computer Assisted Coding Number of Large Physician Practices, CAC Installed Base, Market Forecasts, Number, 2017-2023 104
Figure 39. Worldwide and US Computer Assisted Coding Software and Cloud Services CAC Market Forecasts, Dollars, 2017-2023 105
Figure 40. Worldwide and US Computer Assisted Coding for Physicians CAC Market Forecasts, Dollars, 2017-2023 107
Figure 41. US Computer Assisted Coding Physician Software License / Maintenance and Cloud SaaS Services, CAC Market Forecasts, Dollars, 2017-2023 108
Figure 42. US Computer Assisted Coding Software License / Maintenance and Cloud SaaS Services CAC For Large Independent Physician Practices Market Forecasts, Dollars, 2017-2023 109
Figure 43. US Computer Assisted Coding Software Units Retired CAC For Large Independent Physician Practices Market Forecasts, 2017-2023 110
Figure 44. US Computer Assisted Coding Software Units Retired CAC For Large Independent Physician Practices Market Forecasts, 2017-2023 111
Figure 45. US Computer Assisted Coding Software and Cloud SaaS Services CAC For Independent Radiology Clinics Market Forecasts, Dollars, 2017-2023 112
Figure 46. US Computer Assisted Coding CAC Software License / Maintenance and Cloud SaaS Percent Penetration For Independent
Computer Assisted Coding Table of Contents

Radiology Clinics Market Forecasts, Dollars, 2017-2023
Figure 47. US Outpatient Procedures Forecasts, Number of Procedures, 2016-2023
Figure 48. US Computer Assisted Coding Outpatient Procedure Market Penetration Forecasts, % Penetration, 2017-2023
Figure 49. 3M™ APR DRG Software Functions:
2.5 Making The Shift To The Modern ICD-10 Requirements
Figure 50. Computer Assisted Coding Regional Market Segments Dollars, Worldwide, 2016
Figure 51. Computer Assisted Coding Regional Market Segments Dollars, Worldwide, 2016
Figure 52. 3M 360 Encompass 1,500 Hospitals And Healthcare User Organizations
Figure 53. 3M 360 Encompass 1,500 Hospitals And Healthcare User Organizations
Figure 54. 3M 3M CodeAssist System Features
Figure 55. 3M Codefinder Functions
Figure 56. 3M Codefinder Features
Figure 57. 3M Codefinder Intelligent Functions
Figure 58. 3M APR DRG Solutions Aspects
Figure 59. 3M Applications For Severity- And Risk-Adjusted Data
Figure 60. 3M Classification System
Figure 61. 3M APR DRG Software Features
Figure 62. 3M Medical Coding Tools
Figure 63. 3M DataScout Functions
Figure 64. 3M Clinical Information Extraction Functions
Figure 65. 3M Systems For Overcoming Documentation Shortfalls Focus
Figure 66. 3M Systems Topics
Figure 67. 3M Systems Metrics Included For Computerized Coding 157
Figure 68. 3M Web-Based Coding Software Return On Investment Metrics 171
Figure 69. 3M Web-Based Coding Software Key Benefits 172
Figure 70. 3M Coding Software Functions 173
Figure 71. 3M Coding Software Features 173
Figure 72. 3M Internet-Based Computer-Assisted Medical Coding Target Markets 175
Figure 73. 3M CodeAssist Functions 177
Figure 74. 3M CodeComplete Functions 178
Figure 75. Dolbey Fusion CAC Benefits 180
Figure 76. Dolbey Computer-Assisted Coding Solution Features 182
Figure 77. Dolby Computer Assisted Coding CAC Fusion Suite Modules 185
Figure 78. Optum Computer-Assisted Coding (CAC) Intelligent CAC Functions: 187
Figure 79. Optum Coding Service 188
Figure 80. Optum Medicare Fee Schedule 190
Figure 81. McKesson Practice Management Priorities 192
Figure 82. Cerner Discern nCode Functions 197
Figure 83. Cerner Discern nCode Key Features 198
Figure 84. Platocode Process 200
Figure 85. PlatoCode Code Set Filters 201
Figure 86. Nuance Personnel Impacted by Transition to ICD-10 206
Figure 87. ICD-10 Critical Business Concerns: 207
Figure 88. Nuance Clintegrity Facility Coding Healthcare Solutions Platform Functions 209
Figure 89. Nuance Clintegrity Facility Coding Healthcare Solution Functions 210
Figure 90. Nuance Clintegrity Computer Assisted Coding (CAC) Professional Fee Coding Functions 213
Figure 91. Nuance Clintegrity Clinician Coding Features 214
Figure 92. Nuance Clintegrity Facility Coding Features 216
Figure 93. Nuance Clintegrity Platform Modules 217
Figure 94. Nuance Clintegrity Platform, Modules Customizable Data Collection Fields Features 218
Figure 95. Nuance Advantages Of Automating Coding With Clintegrity 220
Figure 96. Nuance Coding Algorithms 221
Figure 97. Nuance Mapping And Modeling Disparate Controlled Medical Vocabulary Functions 223
Figure 98. Artificial Medical Intelligence EMscribe CAC 224
Figure 99. Artificial Medical Intelligence EMscribe Dynamic Search 225
Figure 100. Artificial Medical Intelligence (Ami) Emscribe™ Dx Benefits 231
Figure 101. Precyse Coding Services 238
Figure 102. PrecyseCode™ CAC Coding Functions 239
Figure 103. Computer Assisted Technology Functions 241
Figure 104. How ICD-9 and ICD-10 Are Different 245
Figure 105. ICD-9 and ICD-10 Different Formats 246
Figure 106. Semantic Indexing for Medical Ontology 257
Figure 107. Semantic Process Flow Index Component Medical Ontology 258
Figure 108. Information Extraction With Tessi® Extraction Engine Functions 259
Figure 109. 3M 360 Encompass 1,500 Hospitals And Healthcare User Organizations 270
Figure 110. Current EPIC Computer Assisted Coding CAC Integrations 274