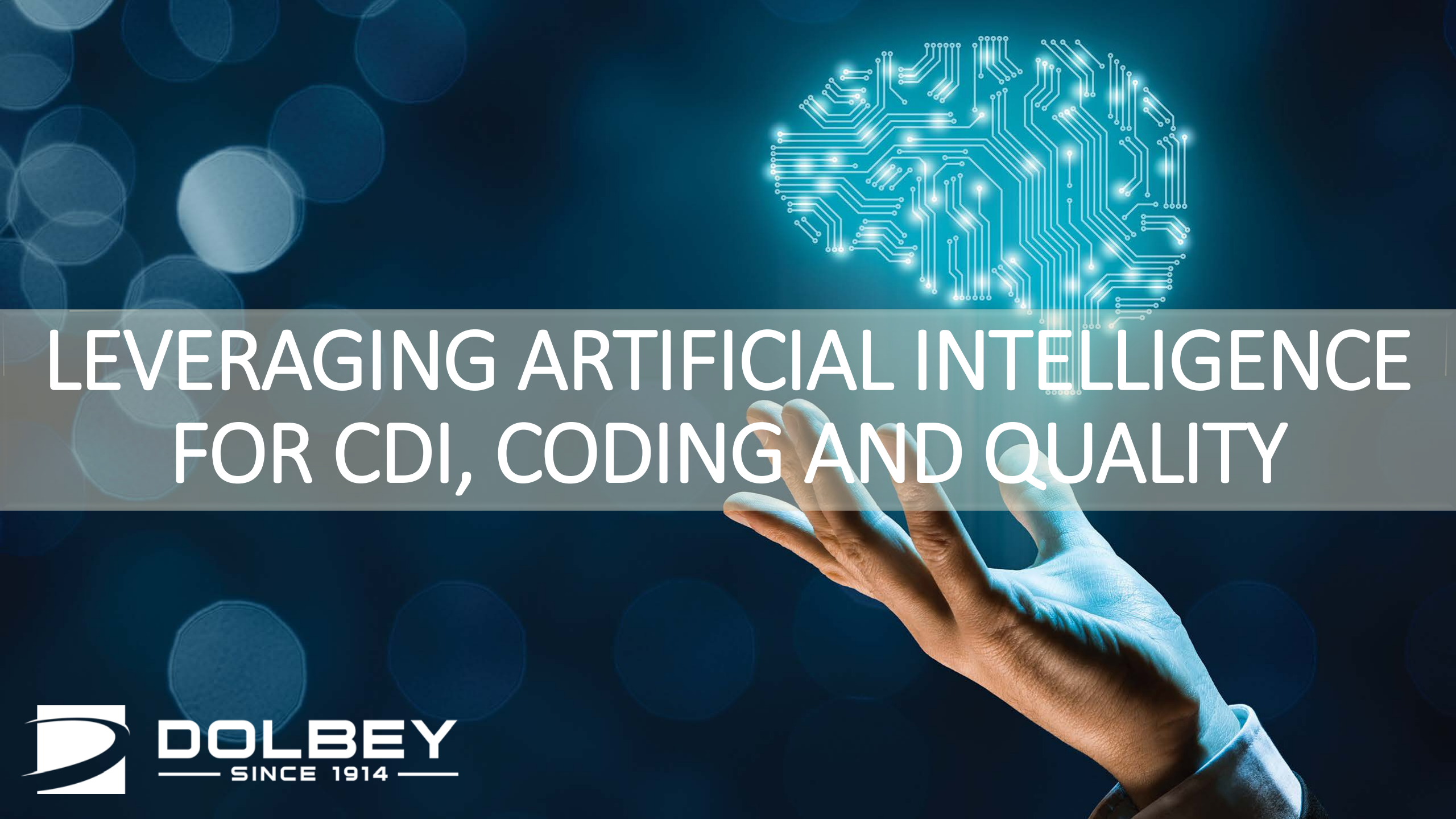

LEVERAGING ARTIFICIAL INTELLIGENCE FOR CDI, CODING AND QUALITY

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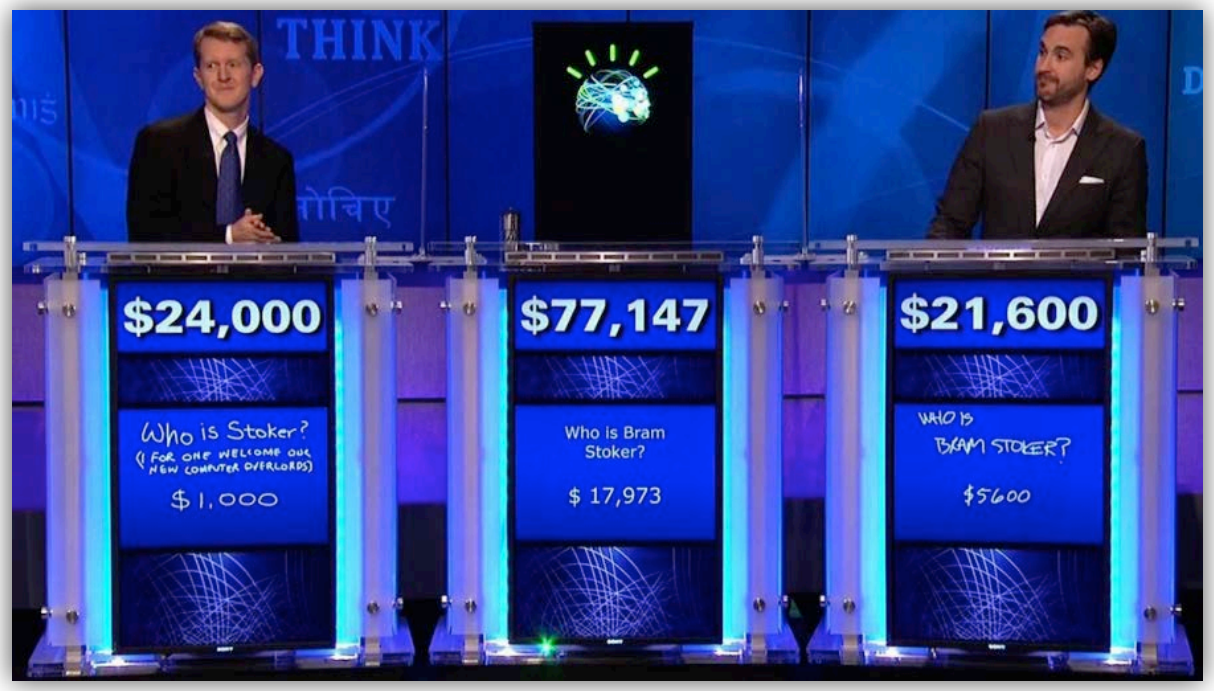
AGENDA

- Artificial Intelligence (AI) Overview
- AI vs Machine Learning vs NLP vs Deep Learning
- Review of AI in Healthcare
- How is AI being leveraged for CDI, Coding and Quality
- Discussion of Early Results and Successes

AI IN EVERYDAY LIFE

- Whether you're aware of it or not, AI has a massive impact on our daily lives.
- For most of us it's in our phones, it's helping us do our jobs more efficiently and it's generally making our lives easier. And the best part – this is only the beginning.



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ARTIFICIAL INTELLIGENCE (AI)

noun

The theory and development of computer systems able to perform tasks that normally require human intelligence, such as visual perception, speech recognition, decision-making, and translation between languages.

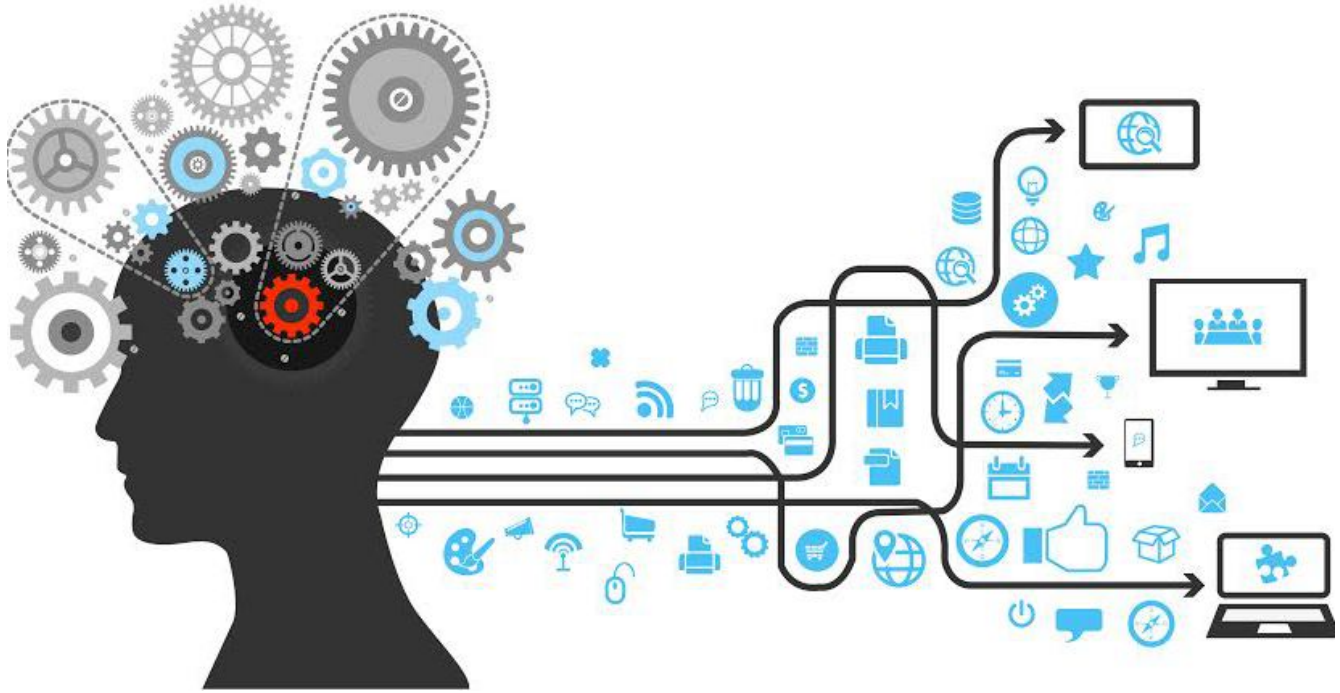
NLP VS MACHINE LEARNING

- **Natural Language Processing (NLP)**
  - Where AI and linguistics come together
  - Involves intelligent analysis of written language
  - Allows you gain insight from large amounts of plain text data
- **Machine Learning (ML)**
  - AI that is a set of statistical techniques for problem solving, learns from experience
  - Applied to a wide variety of problems: fraud detection, price prediction and even NLP
  - Most AI now involves ML because intelligent behavior requires significant knowledge and learning is the easiest way to get knowledge
  - A clever program with human like behavior can be AI, but unless its parameters are automatically learned from data, it's not machine learning
- **ML with NLP**
  - Building systems that can learn how to understand language

*What's The Difference Between Machine Learning And Artificial Intelligence? Forbes 10/20/17

DEEP LEARNING

- Deep learning (also known as deep structured learning or hierarchical learning) is part of a broader family of machine learning methods based on learning data representations, as opposed to task-specific algorithms. Learning can be supervised, semi-supervised or unsupervised.
- Deep learning models are loosely related to information processing and communication patterns in a biological nervous system, such as neural coding that attempts to define a relationship between various stimuli and associated neuronal responses in the brain.
- Deep learning architectures such as deep neural networks, deep belief networks and recurrent neural networks have been applied to fields including computer vision, speech recognition, natural language processing, audio recognition, social network filtering, machine translation, bioinformatics and drug design.



AI THINKS AND PAYS FOR ITSELF

AS AI GAINS EXPERIENCE IN HEALTHCARE, IT'S ABILITY TO LEARN AND ACT WILL CONTINUALLY LEAD TO IMPROVEMENTS IN PRECISION, EFFICIENCY AND OUTCOMES.

*Artificial Intelligence: Healthcare's New Nervous System by Accenture

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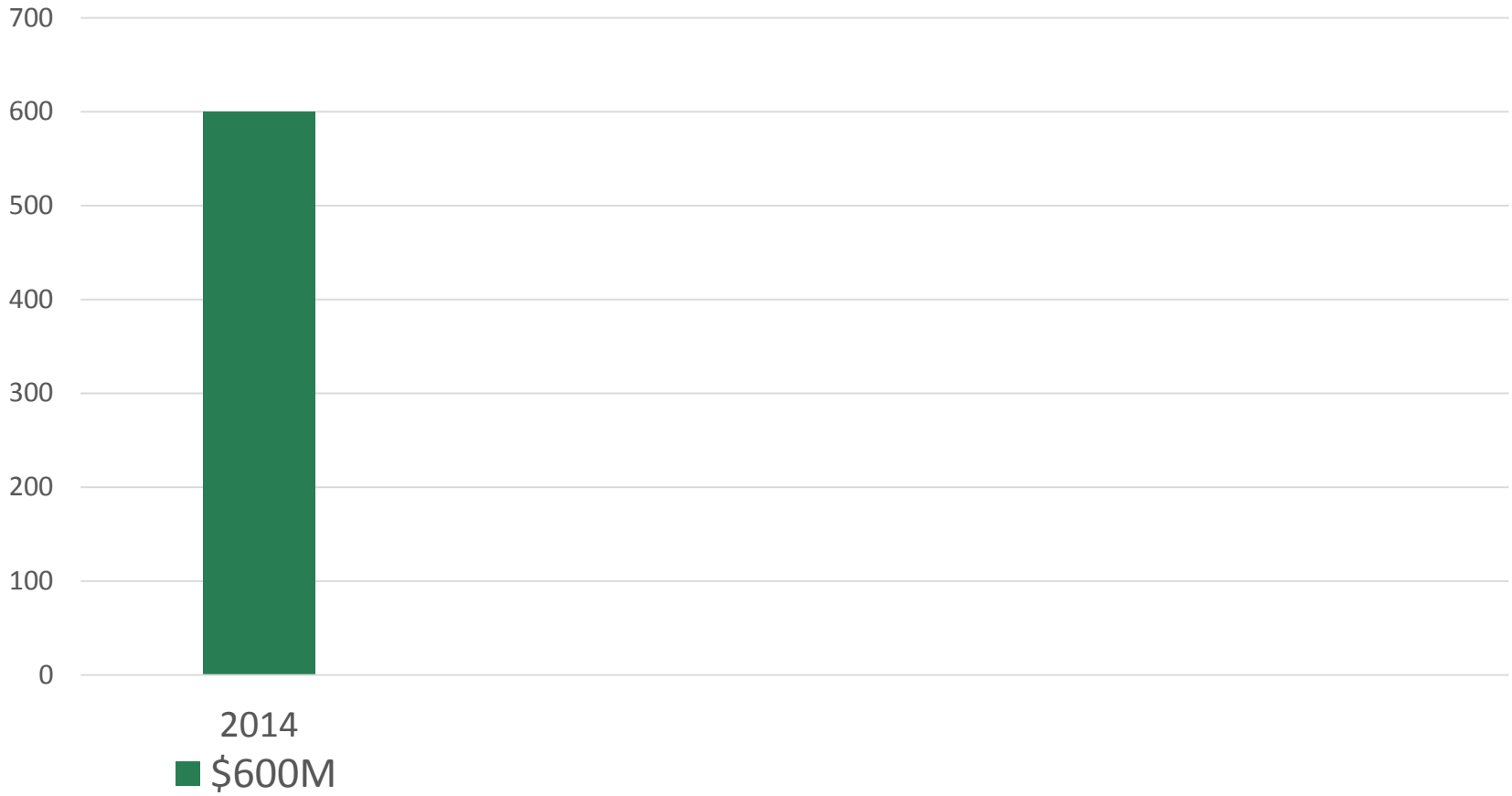
HEALTH AI MARKET SIZE 2014



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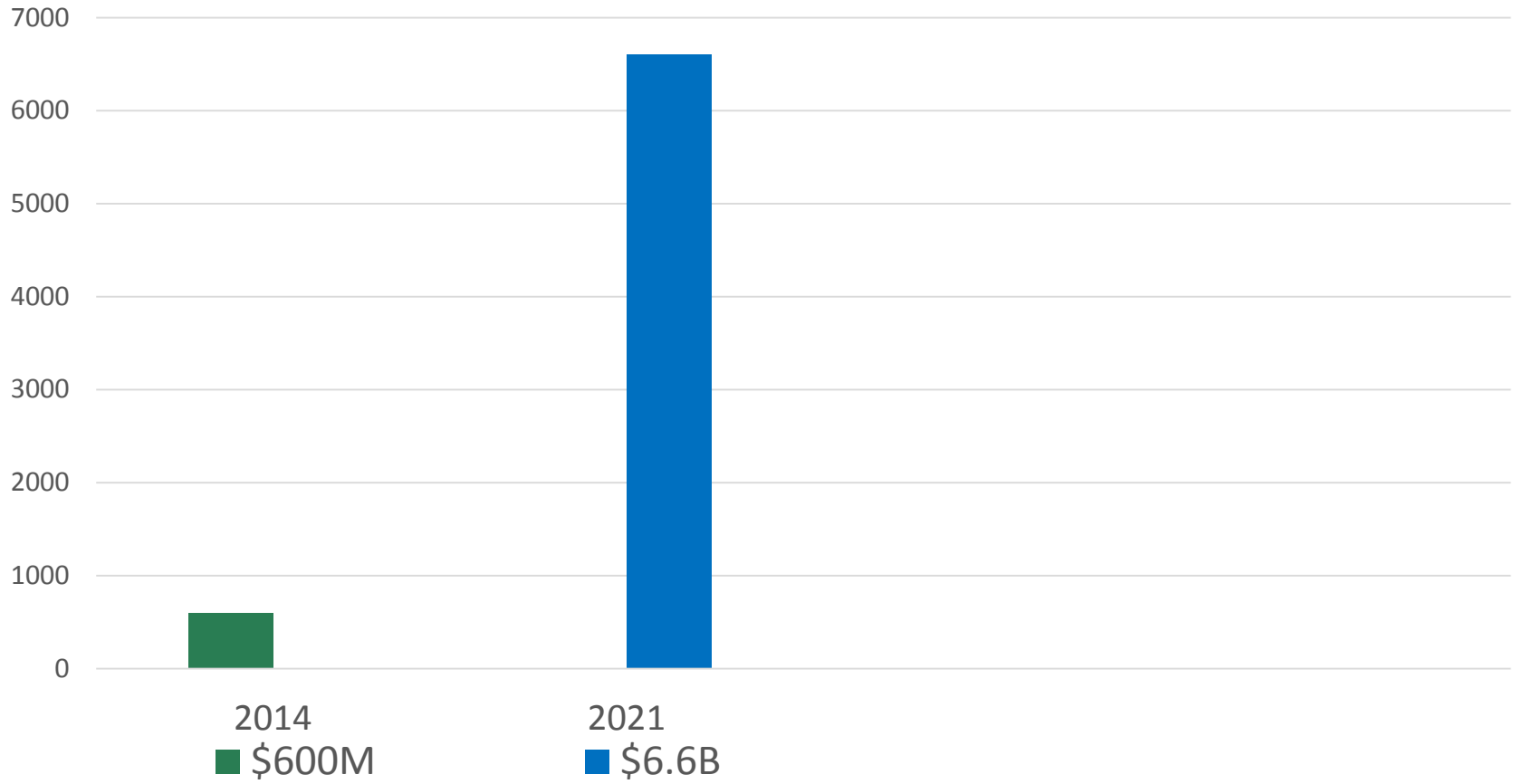
HEALTH AI MARKET SIZE 2014-2021



*Artificial Intelligence: Healthcare's New Nervous System by Accenture

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TOP 10 AI APPLICATIONS IN TERMS OF VALUE* TO HEALTHCARE

Source: Accenture analysis

* "Value" is the estimated potential annual benefits for each application by 2026.
** Orthopedic surgery specific

MINING MEDICAL RECORDS

- **Google Deepmind Health-** Mines medical records to provide better/faster health services
- **IBM WatsonPaths (Cleveland Clinic/Case Western)-** mines records to allow physicians to make more informed and accurate decisions faster
- **Careskore-** reviews a combination of labs, demographic data and behavioral data to predict how likely a patient is to be readmitted to the hospital
- **Zephyr Health-** helps life sciences companies reduce the time it takes to bring therapies to market

The Medical Futurist: Top AI Companies in Healthcare to Keep an Eye On

Disrupting Medical Imaging

- **Butterfly Network-** working to create a handheld medical imaging device that can make both MRI and ultrasounds significantly cheaper and more efficient
- **3Scan-** creating robotic microscopes and machine vision to generate better view about tissues
- **Enlitic-** using deep learning to interpret radiology images in milliseconds- up to 10,000 times faster than the average radiologist (50% better at classifying malignant tumors and a false-negative rate of zero, compared with 7% for the humans)
- **Arterys-** cloud based AI than can complete an MRI scan in 6-10 minutes. Designed to acquire seven dimensions of data which include 3D heart anatomy, blood flow rate and blood flow direction
- **Bay Labs-** uses deep learning to help medical professionals in developing countries interpret ultrasounds so they can better treat heart disease

The Medical Futurist: Top AI Companies in Healthcare to Keep an Eye On

FASTER BIOLOGICAL AND DRUG DEVELOPMENT

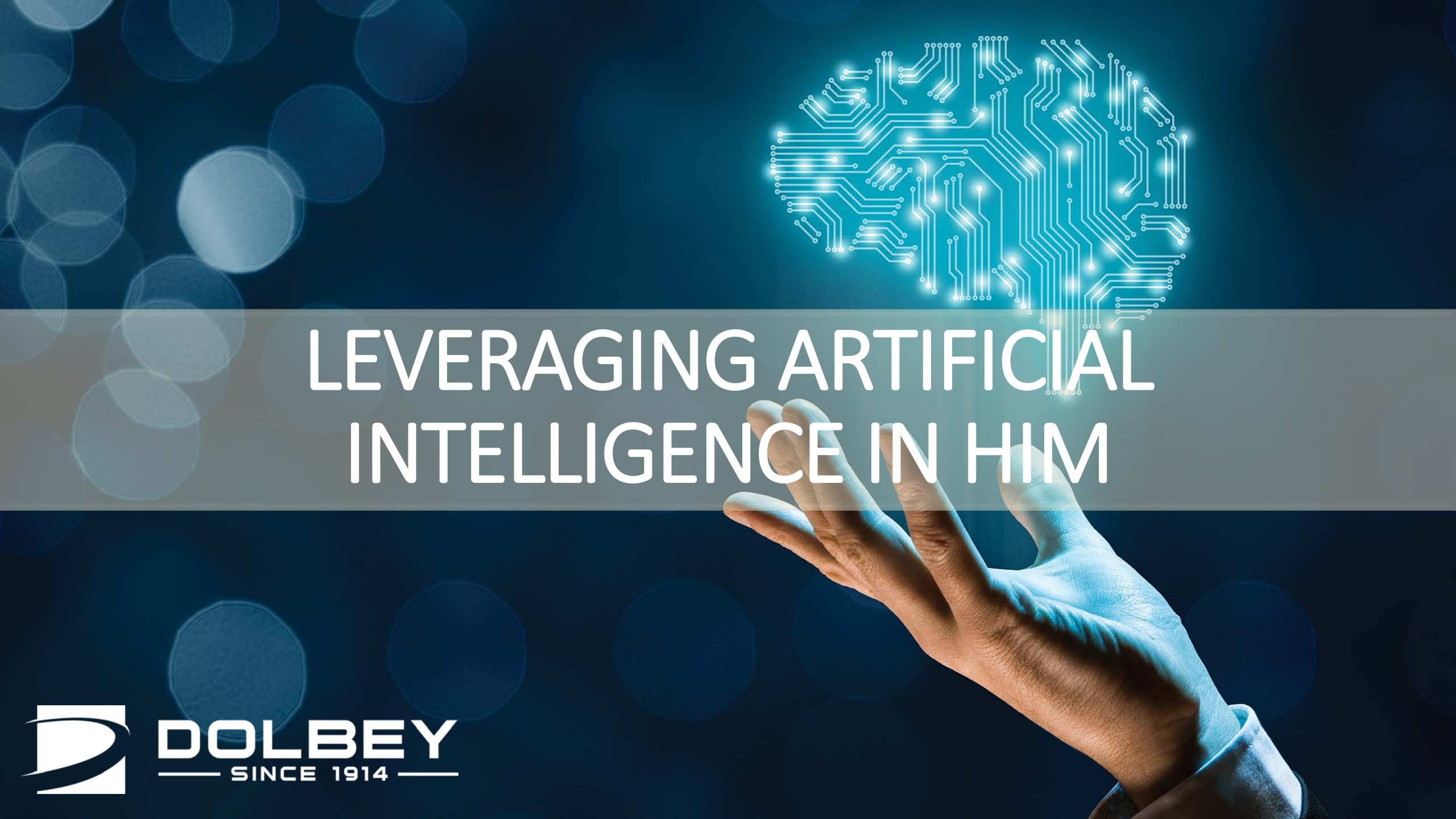
- **Atomwise-** using supercomputers to predict from a database of molecular structures, in advance, which potential medicines will work, and which won't
- **Recursion Pharmaceuticals-** started to build a proprietary drug discovery platform that uses the best elements of high-throughput biology and AI
- **Whole Biome-** bringing the public improved health solutions through microbiome interventions. Microbiomes are all of the microbes on each individual
- **iCarbonX-** creates a "digital you" that contains biological samples such as saliva, proteins, and DNA: bolstered by environmental data such as air quality, workout regimes and diet
- **Deep Genomics-** leveraging artificial intelligence, specifically deep learning to help decode the meaning of the genome

The Medical Futurist: Top AI Companies in Healthcare to Keep an Eye On

USING AI TO PREDICT WHEN WE'LL DIE?

- Stanford researchers used an AI Deep Learning model to look at 160k deceased patient records that included date of death
- No predefined rules were given, the model learned to make predictions after studying massive data sets
- Knowing exact date of death, AI searched for patterns indicative of advanced illness and assigned weights to various pieces of medical information
- When tested on another set of 40k patients, with date of death withheld, AI was able to determine if the patient died within a 3-12 month window with 90% accuracy
- Conventional non-AI models have only reached 70-80% accuracy
- Researchers feel this information may lead to better use of palliative care……

nbcnews.com by Joseph Bennington-Castro 2/3/18



LEVERAGING ARTIFICIAL INTELLIGENCE IN HIM

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FRONT-END: CLINICAL DOCUMENATION IMPROVEMENT

- **AKA:** Computer-Assisted Physician Documentation (CAPD)
- Provides real-time feedback to the physician that helps identify incomplete or inaccurate documentation in real-time while the document is being created.
  - Patient Demographics
    - Gender
    - Age
  - Guidelines & Specificity
    - Diagnosis
    - Procedure

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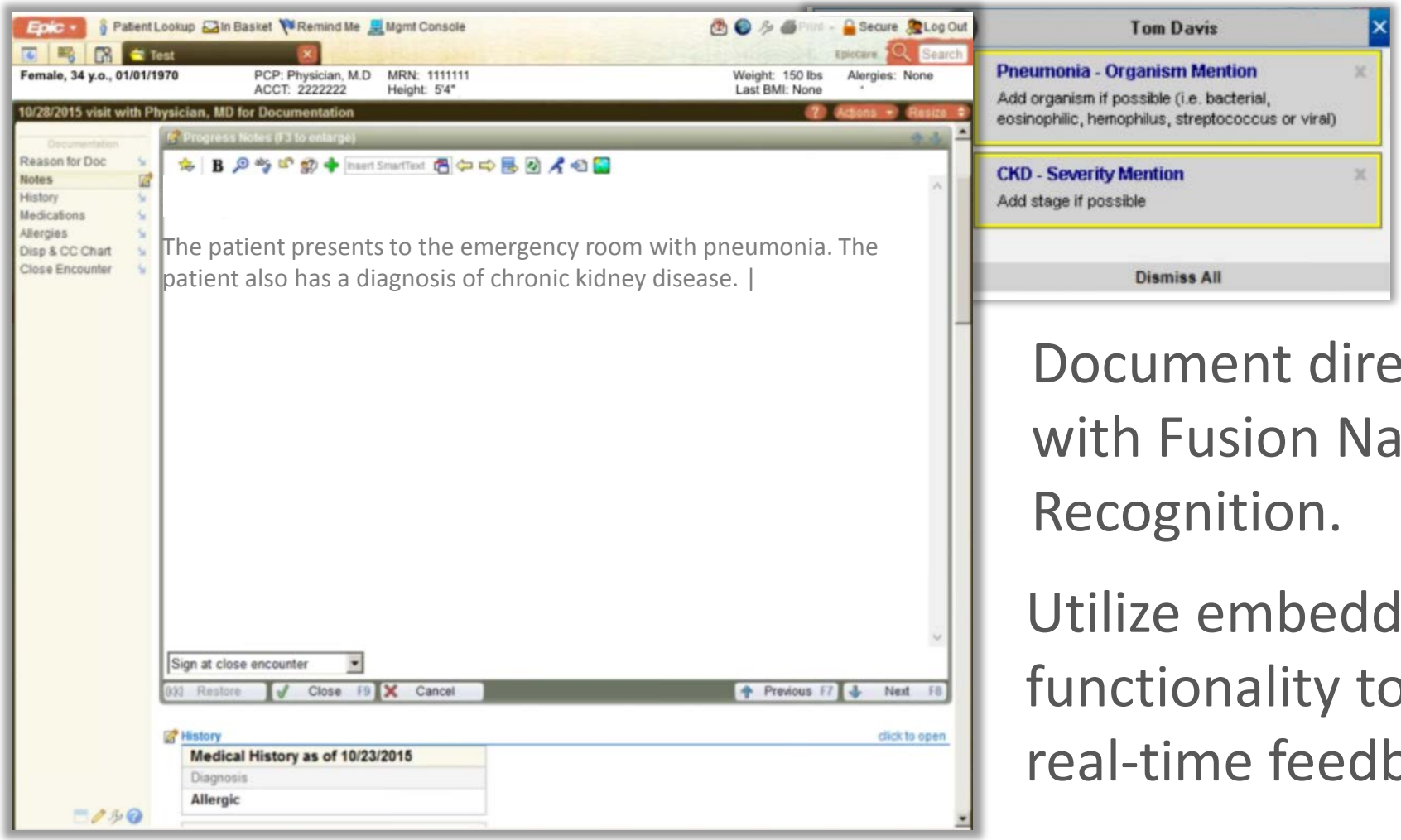
WHY THE NEED FOR CAPD?

- Growing documentation requirements for physicians take time away from patient care.
- Severity of illness and complexity of care are not adequately documented.
- Post-discharge queries from CDS can be ineffective, costly and disruptive.
- Quality improvement and revenue opportunities are missed.

WHY AI IN CAPD?

- Allows physicians work smarter and faster, not harder.
- AI has improved the quality and completeness of the clinical documentation at the point of care.
- Enables physicians to address everyday gaps in specificity at the time of documentation.
- Achieved results:
  - 20% Reduction in Retrospective Queries
  - 5% increase in CMI (monthly average)
  - 7.5% increase (monthly average) in Complications or Comorbidities capture
  - 25% reduction in discharges with unspecified heart failure documentation

EXAMPLE OF CAPD



Document directly in the EHR with Fusion Narrate Speech Recognition.

Utilize embedded CAPD functionality to deliver real-time feedback to providers.

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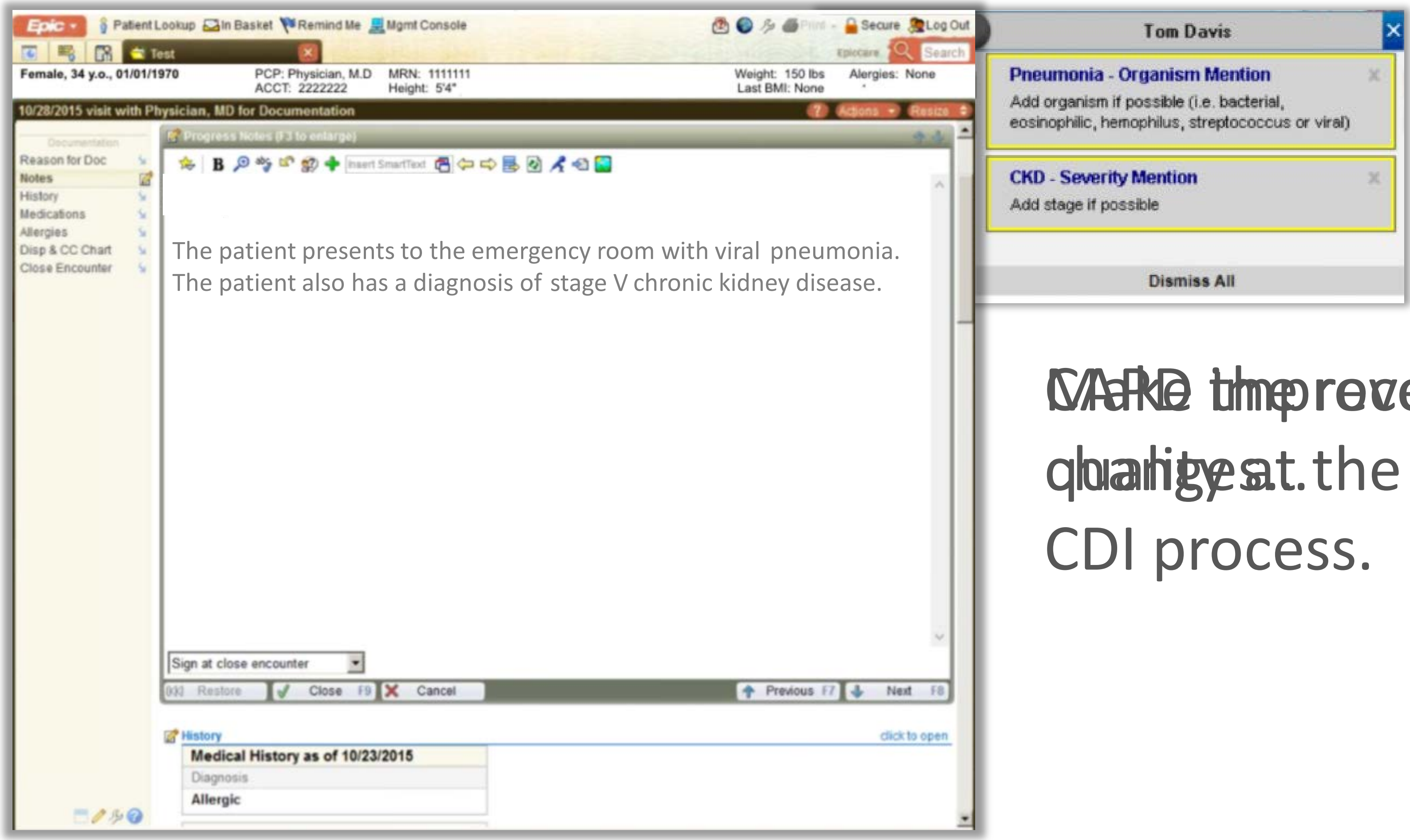
EXAMPLE OF CAPD



CAPD improves document quality at the front end of the CDI process.

Make the recommended changes.

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BACK-END: CLINICAL DOCUMENATION IMPROVEMENT

- Traditional CDI solution
- Solution for CDS that provides workflow, tracking and impact reporting.
- Many different flavors of CDI solutions:
  - Manual: Excel/Access Database
  - Software with or without AI
  - Embedded with or without Computer-Assisted Coding

WHY THE NEED FOR AI IN BACK-END CDI?

- Striving for 100% case coverage for all payors
- Ensuring the documentation is an accurate representation of the quality care provided to receive proper reimbursement.
- Broadening scope of patient types to include:
  - Emergency
  - Same Day Surgery
  - Physician Offices

HOW DOES AI HELP WITH BACK-END CDI?

- Prioritization allows the CDS to know where to focus and when.
- AI reviews the patient chart for clinical indicators, diagnosis, and procedure details to suggest opportunities through workflow.
- Prioritized by:
  - Case Status
  - DRG Opportunity
  - Clinical Indicators/Diagnosis/Procedures
  - 30 Day Readmission
  - HCC Indicators
  - CC/MCC
  - Core Measure/PSI/PQRS/HAC Indicators

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COMPUTER-ASSISTED CODING (CAC)

- CAC is software that analyzes healthcare documents and produces appropriate medical codes for specific phrases and terms within the document.
- Today at many hospitals CAC provides:
  - Coding Workspace
  - Diagnosis and Procedure Suggestions
  - Book Marks and Communication
  - Custom Abstraction
  - Audit Tools
  - Query Integration
  - Reporting and Analysis

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HOW CAN AI IMPACT CODING

- Increase Accuracy
- Improve Productivity
  - Code suggestions
  - Streamline Workflow
  - Decrease in A/R Days
- Reduce Denials with front end medical necessity edits
- Allow for traceability of codes for increased ease of audits

Acct# 1187358953: 10/22/2017 - Current (143 Days)

Compute | Cancel | Save | Submit

Smith, Jonathan M (Male, 58 DOB: 02/28/1959) MRN# 4875210624

Admit Info	**Admit Reason:** CHANGE IN MENTAL STATUS HYPOXIC **Attending:** EMINGER, HEATHER (092484)
Location	**Facility:** Dolbey Memorial East Room 401 -B
Financial	**Primary Insurance:** Anthem

Navigation

+Add

- Code Summary
- Patient Info
- Notes & Bookmarks
- Physicians & Queries
- Previous HCC Overview
- $ Charges
- Discrete Values

Documents

Search

- *ED*
  - ED Report
- *History and Physical*
  - History & Physical
- *Consults*
  - Consultation
  - Consultation
  - Nephrology Consultation
- *Radiology*
  - CT ABD & Pelvis w/o Con

History & Physical

Add codes... | Encoder | **Additional Codes:**

CHIEF COMPLAINT: Altered mental status.

HISTORY OF PRESENT ILLNESS: The patient is a 68-year-old male who presents with his great niece due to altered mental status for a couple of days. The patient has a past medical history of Dementia[F03.90], COPD[J44.9], chronic back pain[G89.29][M54.9], hypertension[I10], and anxiety[F41.9]. The patient is sedated and intubated and history was obtained from records, ER doctor, and family member. 68-year-old male with past medical history of Dementia, COPD, hypertension, anxiety, was brought in by his family member after she has noticed him to be increasingly confused[R41.0] and agitated over the past 2 days. Today ED visited prompted was due very, very aggressive/agitated behavior. Inaddition, it is noted that patient was short of breath[R06.02] at home. During my encounter, the patient is intubated and sedated. He cannot interact this time.

PAST MEDICAL HISTORY: Dementia[F03.90], Hypertension[I10], COPD[J44.9] on 3 L nasal cannula oxygen at home, chronic back pain[G89.29][M54.9], anxiety[F41.9].

PAST SURGICAL HISTORY: Cholecystectomy[Z90.49] and shoulder surgery.

FAMILY HISTORY: Family history of coronary artery disease[I25.10].

SOCIAL HISTORY: The patient lives with his niece, who is his power of attorney, Caroline Shields, and has a smoking history. He quit 10 years ago.

ALLERGIES: He denies any old. He reports no new allergies.

REVIEW OF SYSTEMS: Cannot be obtained at this time as the patient is intubated and sedated.

PHYSICAL EXAM:
Vitals: Temperature 166/42, pulse 70, respiratory rate 20,and temperature 97.8.
General: The patient is intubated and sedated.
HEENT: Mucous moist membranes. Sclerae white. Conjunctivae pink. Rightpupil sluggish. Left pupil reacts to light appropriately.
Chest: Diffuse rhonchi - wheezing[R06.2], bronchial breath sounds.

Assigned Codes

+Add Set

- *Admit Diagnosis*
- *Assigned Diagnoses*
- *Assigned ICD-10 Procedures*
- *Assigned CPT® Codes*

Unassigned Codes

Show All

- *Diagnosis Codes*
  - A31.9 - Mycobacterial infection, unspecifi
  - D64.9 - Anemia, unspecified
  - D72.829 - Elevated white blood cell coun
  - E83.51 - Hypocalcemia
  - E87.2 - Acidosis
  - F03.90 - Unspecified dementia without be
  - F11.90 - Opioid use, unspecified, uncompl
  - F15.10 - Other stimulant abuse, uncompli
  - F22 - Delusional disorders
  - F32.0 - Major depressive disorder, single e
  - F41.9 - Anxiety disorder, unspecified
  - G25.2 - Other specified forms of tremor
  - G89.29 - Other chronic pain
  - I10 - Essential (primary) hypertension

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BENEFITS OF INTEGRATED CAC AND CDI SOLUTIONS

- Allows CDI and coders to work within one system.
- Integrated collaboration tools like automated reconciliation workflow
- All information stays with the chart not the person who added the information.
  - Worksheets
  - Queries
  - Coding/CDI Notes

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COLLABORATION BENEFITS

- NLP Suggestions
- Real-time Patient Census Dashboards
- Optional Query Integration
- Easy to use Query Template Editor
- Streamline Workflow; Concurrent and/or Post Discharge
- Clinical Indicator Workflow with Chart Prioritization
- Automated Reconciliation Workflow
- HCC Indicators and Lookback Links
- Readmission Indicator Flag with Previous Diagnosis Info
- Executive Dashboard, Reporting & Query Scorecards

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AI IN QUALITY

- Each patient encounter is reflected in numerous metrics that measure performance and drive revenue.
- Inpatient Quality Indicators such as PSIs and HACs are just a few measures impacted.
- Outpatient Quality Indicators such as ACO performance metrics, and MIPS scores for MACRA are all influenced by the coding of the encounter.
- Endless opportunities for coding and quality measure accuracy to go off the rails due to lack of communication, limited integration and other issues.
- This is a big job with all other regulatory changes and productivity and accuracy to keep up with.

HACs AND PSIs

- CAC has an excellent way to flag charts for HACs and we use this feature to roll up all HACs to senior coders before dropping the claim.
- We monitor PSIs basically the same way by forwarding all accounts with a possible PSI to a senior coder.
- CAC has a function for chart routing that makes this seamless.

AI FOR ADDITIONAL TEAMS

- Case Management, Utilization Review and various HIM roles, also leverage this data for various purposes.
- This influx of activity makes concurrent review of the data (and subsequent coding) a seemingly impossible task.
- Many organizations do a retrospective audit to review for quality metrics.
- Challenge is that its to late too improve patient care or to earn the deserved revenue.

OUTCOMES OF CAC WITH AI

- Unbilled – calculated on > 6 days post discharge
  - Before CAC $27M
  - After CAC $8.4M
- CMI
  - Up in Surgery Service Line by as much as .4
- CDI Post Discharge Queries
  - Down across the board
  - 500-700 per month prior, 170 after (10 hospitals)
  - Audits 4th quarter 2016 best every 99.9% overall
- Standard process and workflow for coding

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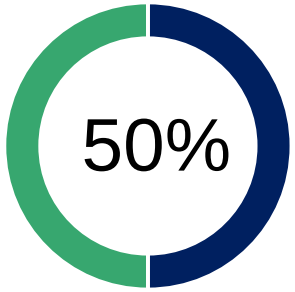
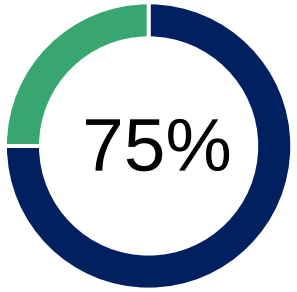
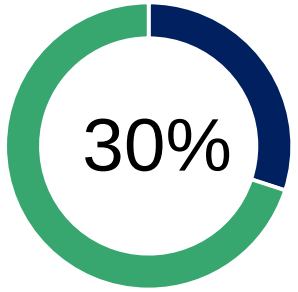
PRODUCTIVITY GAINS



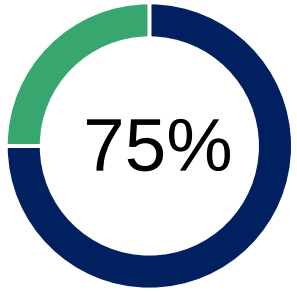
INPATIENT
From 20 to 30



EMERGENCY
From 100 to 175



OUTPATIENT
From 200 to 260



DAY SURGERY
From 40 to 70

“ 99% *Audits overall.* ”

“ + .4 *CMI increase in Surgery Service Line.* ”

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OUTCOMES OF CDI WITH AI

- Streamlining manual processes allowing for 100% case coverage for inpatient and observation patients while also expanding to the emergency department with the same staff FTEs, while not to sacrifice the quality outcomes of the program.
- Leverage 100% coverage for all payors with same staff
- Reduce post-discharge queries
- Improved response rate and physician satisfaction
- Improved tracking related to CDI impact and trending data
- Improved quality of documentation for accurate reimbursement and accurate reporting of quality and risk indicators

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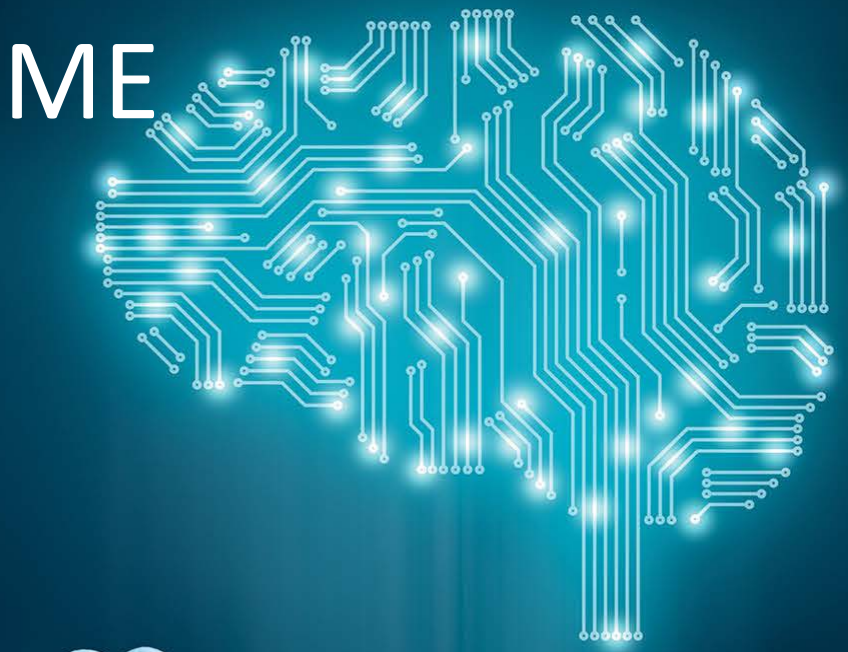
THANK YOU FOR YOUR TIME



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