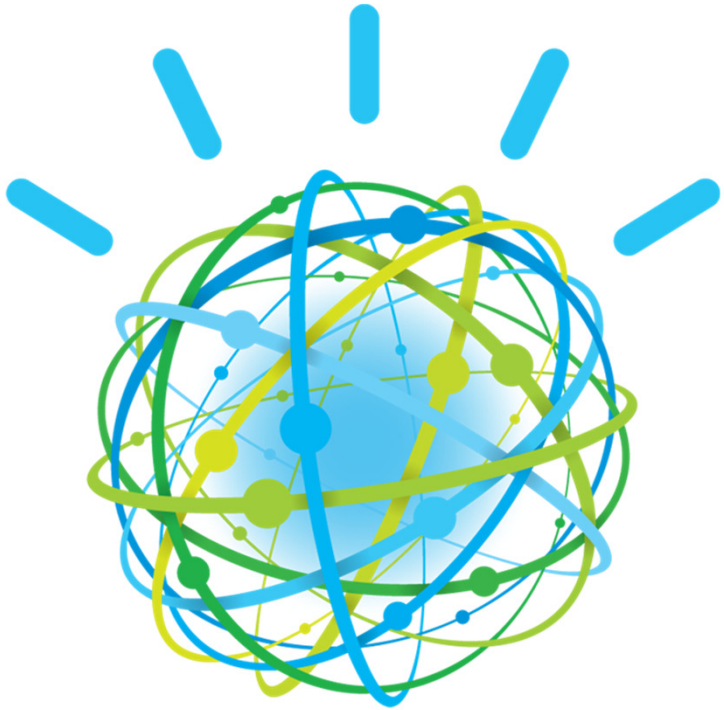
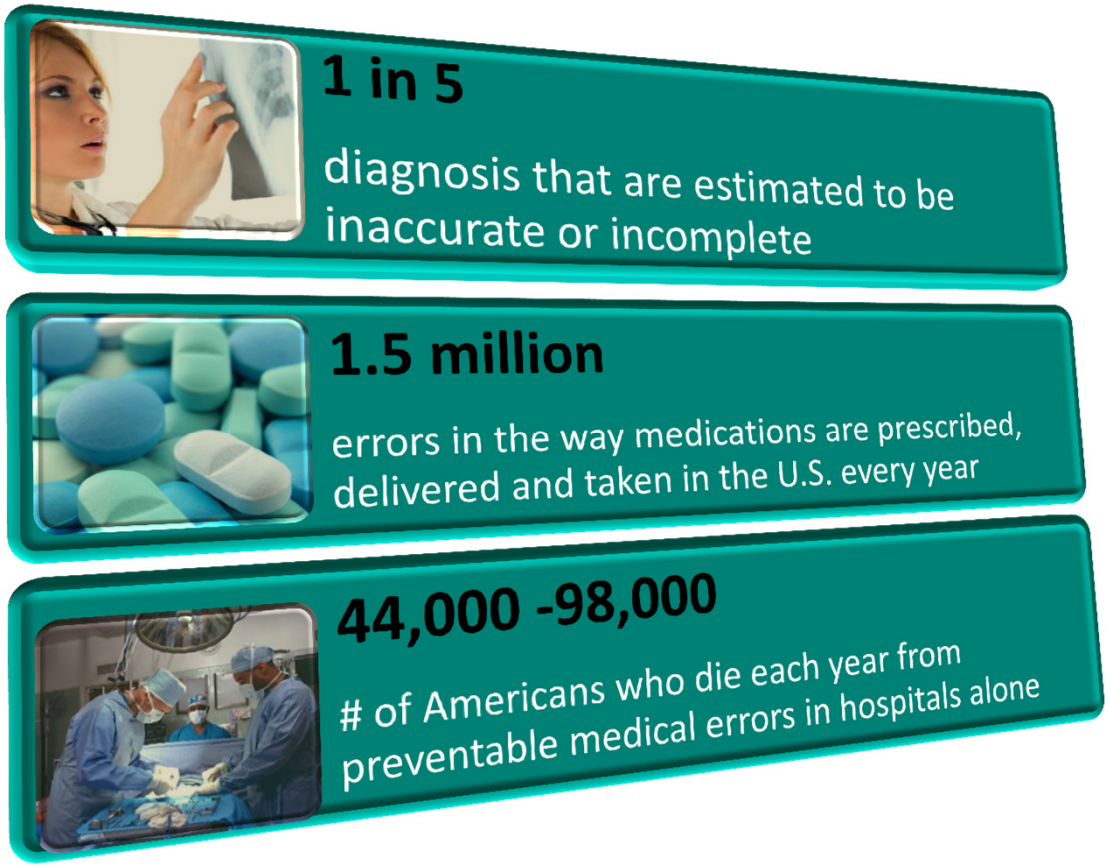
Von der Quizshow ins Geschäftsleben: IBM Watson Analytics im Gesundheitswesen



Thomas Hampp – Senior Technical Staff Member, IBM Deutschland Research & Development

Die Gesundheitsindustrie steht mit vor den komplexesten Herausforderungen in der Informationsbewältigung

- Die medizinische Information verdoppelt sich alle 5 Jahre, vieles davon ist unstrukturiert (Text)
- 81% der Ärzte sagen sie verbringen 5 Stunden oder weniger im Monat mit dem Lesen medizinischer Fachartikel



"Medizin ist zu komplex geworden (und nur) ca. 20% des Wissens, das Ärzte heute nutzen ist evidenz-basiert"

- Steven Shapiro Chief Medical and Scientific Officer, UPMC

Quelle: International Journal of Circumpolar Health, DoctorDirectory.com, Institute for Medicine"

Medical Transcription Discharge Summary Sample # 2:

DATE OF ADMISSION: MM/DD/YYYY

DATE OF DISCHARGE: MM/DD/YYYY

ADMITTING DIAGNOSIS: Syncope.

CHIEF COMPLAINT: Dizziness.

HISTORY OF PRESENT ILLNESS: This is an (XX)-year-old male with past medical history of coronary artery disease, CABG done a few years ago, peripheral neuropathy, recently retired one year ago secondary to leg pain. The patient came to the ER for an episode of vertigo while reading for some books. The patient was able to reach the books, to support self, but did [illegible]. Came to ER and had a CT head, which was within normal limits. The impression was atrophy with old ischemic changes but no acute intracranial findings. No focal weakness. [illegible] episodes since one year. Peripheral neuropathy since one [illegible] of 25 pounds in the last 6 months. [illegible] appetite.

PROCEDURE: Echocardiogram Sample Report:

DATE OF STUDY: MM/DD/YYYY

DATE OF INTERPRETATION OF STUDY:

Echocardiogram was obtained for assessment of left ventricular thickening, [illegible] sclerotic heart disease, pleural pattern. [illegible] intracranial findings.

CONSULTATION: Cardiology Consultation Transcribed Medical Transcription Sample Reports

DATE OF CONSULTATION: MM/DD/YYYY

REFERRING PHYSICIAN: John Doe, MD

CONSULTING PHYSICIAN: Jane Doe, MD

REASON FOR CONSULTATION: Surgical evaluation for coronary artery disease.

HISTORY OF PRESENT ILLNESS: The patient is a (XX)-year-old female who has a known history of coronary artery disease. She underwent previous PTCA and stenting procedures in December and most recently in August. Since that time, she has been relatively stable with medical management. However, in the past several weeks, she started to notice some exertional dyspnea with chest pain. For the most part, the pain subsides with rest. For this reason, she was re-evaluated with a cardiac catheterization. This demonstrated 3-vessel coronary artery disease with a 70% lesion to the right coronary artery; this was a proximal lesion. The left main had a 70% stenosis. The circumflex also had a 99% stenosis. Overall left ventricular function was mildly reduced with an ejection fraction of about 45%. The left ventriculogram did note some apical hypokinesis. In view of these findings, surgical consultation was requested and the patient was seen and evaluated by Dr. Doe.

PAST MEDICAL HISTORY:

1. Coronary artery disease as described above with previous PTCA and stenting procedures.
2. Dyslipidemia.
3. Hypertension.
4. Status post breast lumpectomy for cancer with followup radiation therapy to the chest.

ALLERGIES: None.

MEDICATIONS: Aspirin 81 mg daily, Plavix 75 mg daily, Altace 2.5 mg daily, metoprolol 50 mg b.i.d. and Lipitor 10 mg q.h.s.

SOCIAL HISTORY: She quit smoking approximately 8 months ago. Prior to that time, she had about a 35- to 40-pack-year history. She does not abuse alcohol.

FAMILY MEDICAL HISTORY: Mother died prematurely of breast cancer. Her father died prematurely of gastric carcinoma.

REVIEW OF SYMPTOMS: There is no history of any CVAs, TIAs or seizures. No chronic headaches. No asthma, TB, hemoptysis or productive cough. There is no congenital heart abnormality or rheumatic fever history. She has no palpitations. She notes no nausea, vomiting, constipation, diarrhea, but immediately prior to admission, she did develop some diffuse abdominal discomfort. She says that since then, this has resolved. No diabetes or thyroid problem. There is no depression or psychiatric problems. There is no musculoskeletal disorders or history of gout. There are no hematologic problems or blood dyscrasias. No bleeding tendencies. Again, she had a history of breast cancer and underwent lumpectomy procedures for this with followup radiation therapy. She has been followed in the past 10 years and mammography shows no evidence of any recurrent problems. There is no recent fevers, malaise, changes in appetite or changes in weight.

PHYSICAL EXAMINATION: Her blood pressure is 120/70, pulse is 80. She is in a sinus rhythm on the EKG monitor. Respirations are 18 and unlabored. Temperature is 98.2 degrees Fahrenheit. She weighs 160 pounds, she is 5 feet 4 inches. In general, this was an elderly-appearing, pleasant female who currently is not in acute distress. Skin color and turgor are good. Pupils were equal and reactive to light. Conjunctivae clear. Throat is benign. Mucosa was moist and noncyanotic. Neck veins not distended at 90 degrees. Carotids had 2+ upstrokes bilaterally without bruits. No lymphadenopathy was appreciated. Chest had a normal AP diameter. The lungs were clear in the apices and bases, no wheezing or egophony appreciated. The heart had a normal S1, S2. No murmurs, clicks or gallops. The abdomen was soft, nontender, nondistended. Good bowel sounds present. No hepatosplenomegaly was appreciated. No pulsatile masses were felt. No abdominal bruits were heard. Her pulses are 2+ and equal bilaterally in the upper and lower extremities. No clubbing is appreciated. She is oriented x3. Demonstrated a good amount of strength in the upper and lower extremities. Face was symmetrical. She had a normal gait.

IMPRESSION: This is a (XX)-year-old female with significant multivessel coronary artery disease. The patient also has a left main lesion. She has undergone several PTCA and stenting procedures within the last year to year and a half. At this point, in order to reduce the risk of any possible ischemia in the future, surgical myocardial revascularization is recommended.

PLAN: We will plan to proceed with surgical myocardial revascularization. The risks and benefits of this procedure were explained to the patient. All questions pertaining to this procedure were answered.

FINDINGS:

1. Aortic root appears normal.
2. Left atrium is mildly dilated. No gros
recognized, although subtle abnormalit
atrium is of normal dimension.
3. There is echo dropout of the interat
could not be excluded.
4. Right and left ventricles are normal
ventricular systolic function appears to
fraction is around 55%. Again, due to p
abnormalities in the distribution of late
excluded.
5. Aortic valve is sclerotic with normal
Doppler study demonstrates trace aort
6. Mitral valve leaflets are also scleroti
imaging and Doppler study demonstrat
regurgitation.
7. Tricuspid valve is delicate and opens
clearly seen. No evidence of pericardia

CONCLUSIONS:

1. Poor quality study.
2. Eyeball ejection fraction is 55%.
3. Trace to mild degree of mitral regur
4. Trace aortic regurgitation.

The patient had a chest x-ray, which showed cardiomega
effusion, a left costophrenic angle which has not change
head CT, which showed atrophy with old ischemic chang

Cardiology Consultation Transcribed Medical Transcription Sample Reports

REFERRING PHYSICIAN: John Doe, MD

CONSULTING PHYSICIAN: Jane Doe, MD

HISTORY OF PRESENT ILLNESS: This (XX)-year-old lady is seen in consultation for Dr. John Doe. She has been under consideration for ventral hernia repair and has a background of aortic valve replacement and known coronary artery disease. The patient was admitted with complaints of abdominal pain, anorexia, and vomiting. She underwent a CT scan of the abdomen and pelvis and this showed the ventral hernia involving the transverse colon, but without strangulation. There was an atrophic right kidney. She had bilateral renal cysts. The hepatic flexure wall was thickened. There was sigmoid diverticulosis without diverticulitis. It has been recommended to her that she undergo repair of the ventral hernia. For this reason, cardiology consult is obtained to assess whether she can be cared from the cardiac standpoint.

PAST CARDIAC HISTORY: Bypass surgery. She underwent echocardiography and cardiac catheterization prior to the operation. Echocardiography showed an ejection fraction of 50%. There was marked left ventricular hypertrophy with septal wall 1.60 cm and posterior wall 1.55 cm. Coronary arteriography showed 90% stenosis in the anterior descending artery, situated distally just before the apex of the left ventricle. Only mild to moderate narrowing was seen elsewhere in the coronary circulation.

CORONARY RISK FACTORS: Her father had an irregular heartbeat and her brother had a fatal heart attack. She herself has had high blood pressure for 20 years. She has elevated cholesterol and takes Lipitor. She has had diabetes for 20 years. She is not a cigarette smoker. She does little physical exercise.

REVIEW OF SYMPTOMS: CARDIOVASCULAR AND RESPIRATORY: She has no chest pain. She sometimes becomes short of breath if she walks too far. No cough. She has occasional swelling of her feet. Occasionally, she gets mildly lightheaded. Has not lost consciousness. She tends to be aware of her heartbeat when she is tired. She has no history of heart murmur or rheumatic fever. GASTROINTESTINAL: Recent GI symptoms as noted above, but she does not usually have such problems. She has had no hematemesis. She has no history of ulcer or jaundice. She sometimes [illegible]tion and no blood in the stool. GENITOURINARY: She tends to have [illegible]up once at night to pass urine. No dysuria, incontinence. She has had [illegible]No stones noted. NEUROLOGIC: She has occasional headaches. No [illegible]on, hearing, or speech. No limb weakness. MUSCULOSKELETAL: She [illegible]cle pains and has a history of gout. HEMATOLOGIC: No anemia, [illegible]us blood transfusion. GYNECOLOGIC: No gynecologic or breast

[illegible] She has had shoulder and hand injuries and has had carpal tunnel [illegible]tic and has been on insulin. She has chronic renal insufficiency with [illegible]as had hypothyroidism. She has had morbid obesity. She has chronic [illegible]uses BiPAP. She has had hysterectomy and oophorectomy in the past.

[illegible]spital, she was taking glipizide XL 2.5 mg daily, metoprolol 50 mg [illegible]torvastatin 40 mg daily, Synthroid 75 mcg daily, aspirin 81 mg daily, [illegible]urrently, she is taking Lipitor 40 mg daily, Lantus 10 units at bedtime, [illegible]oprolol 50 mg b.i.d., and Zosyn 2.25 grams q.6h.

[illegible]es not drink alcohol.

[illegible]e is not currently dyspneic, in no distress. She is alert, oriented, and

[illegible]nd react normally. No icterus. Mucous membranes well colored. [illegible]enopathy. Jugular venous pressure not elevated. Carotids equal. [illegible] per minute and regular and the blood pressure 132/78. The cardiac [illegible]. There is a grade 3/6 ejection systolic murmur heard medial to the [illegible]with well heard radiation to the neck vessels. [illegible]cussion and auscultation. Normal respiratory effort. [illegible]der. The presence of a large ventral hernia is noted. [illegible]dema. Posterior tibial pulses were felt bilaterally, but I did not feel the

[illegible] lesions are noted.

[illegible]IOSTIC DATA: Electrolytes are normal. BUN and creatinine 18/2.2. [illegible]t is 7.6, hemoglobin 11.7 with hematocrit 34.9, platelets 187,000. [illegible]bin A1c 7.7. TSH 1.82. Troponin I was normal on three occasions. [illegible]ged heart with postoperative changes, but no evidence of acute [illegible]ble left atrial enlargement. Low voltage QRS, probable inferior wall [illegible]terior wall infarction, age undetermined.

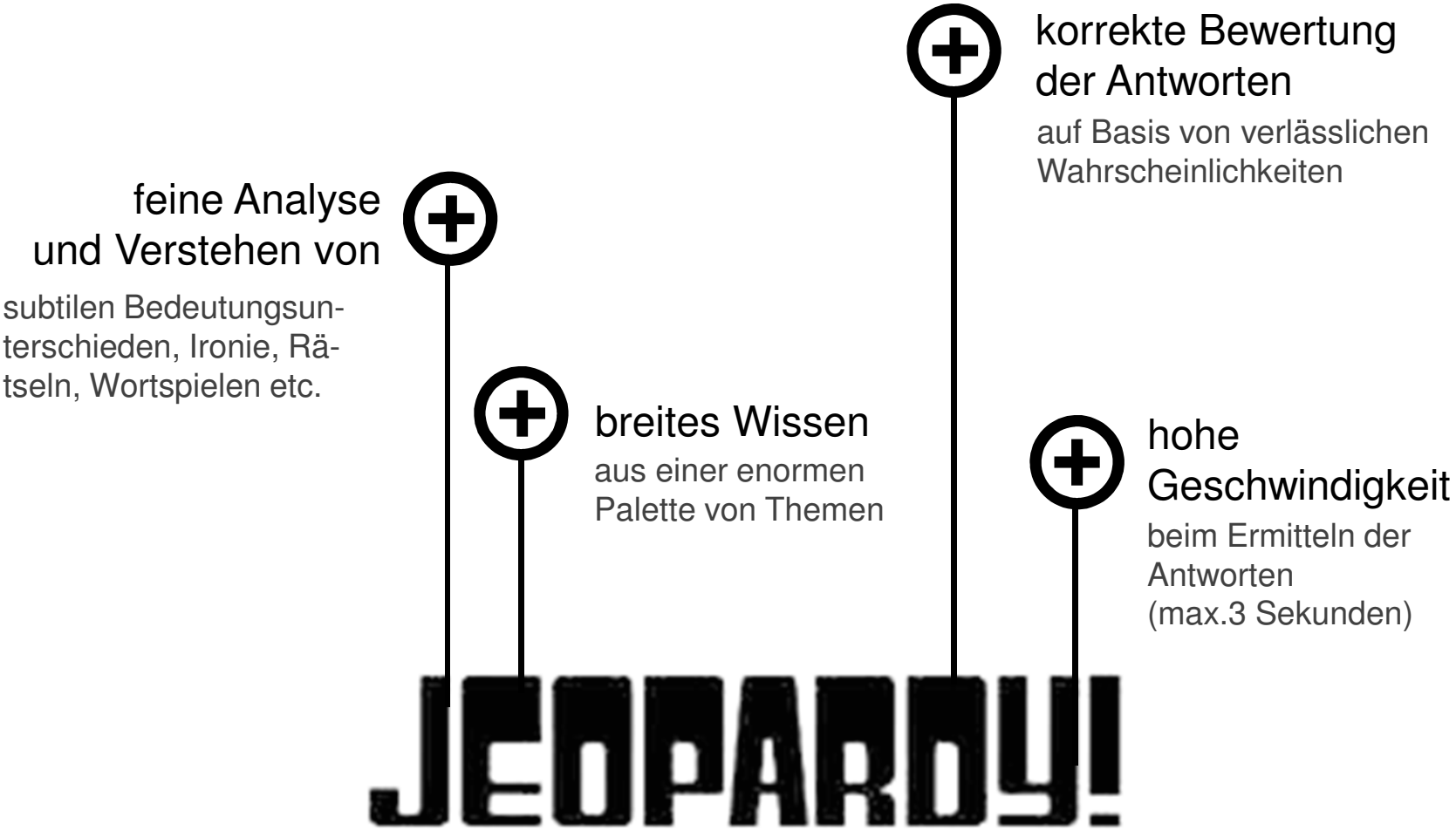
[illegible]with bioprosthetic valve. Residual systolic murmur. [illegible]ase with severe stenosis in anterior descending artery, but this is [illegible]s only a small mass of myocardium. [illegible]cular systolic function. The EKG appearance of previous myocardial [illegible], indicating multiple other medical problems as listed above [illegible]the chart. [illegible] It appears that she does not wish to proceed with the [illegible] if such surgery is not

Die Quizshow und ihr Gewinner

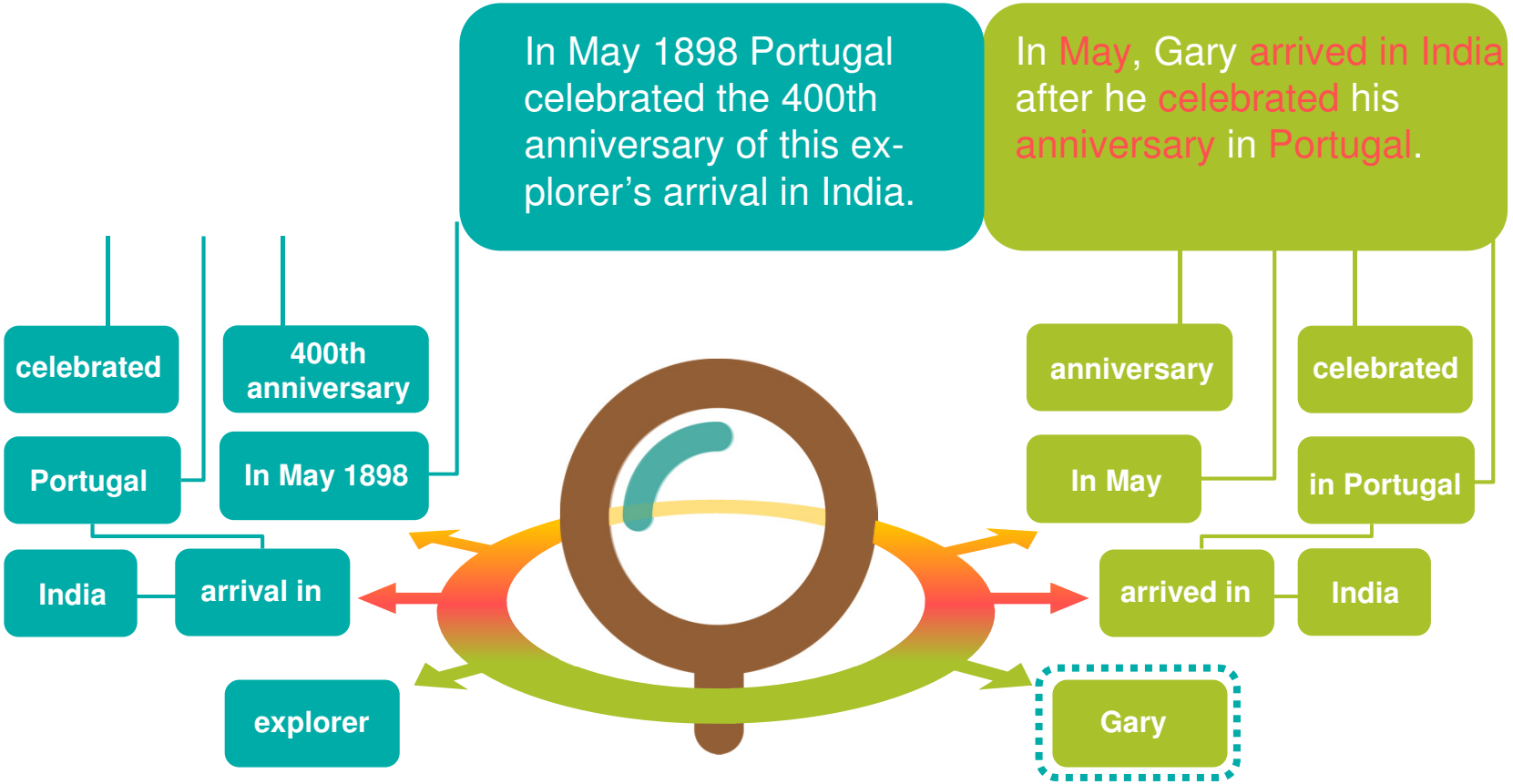
JEOPARDY! The IBM Challenge

- Am 16. Februar 2011 schrieb das IBM Watson System Geschichte
- Watson gewann gegen Ken Jennings und Brad Rutter – die erfolgreichsten Teilnehmer die jemals bei Jeopardy mitgespielt haben
- Watson ist damit das erste Computersystem das der menschlichen Fähigkeit nahekommt natürlichsprachliche Fragen schnell, exakt und mit Konfidenzeinschätzung zu beantworten

Ein Spiel mit ernstem Hintergrund: Jeopardy! als ultimative Herausforderung für ein Computersystem zur Fragebeantwortung

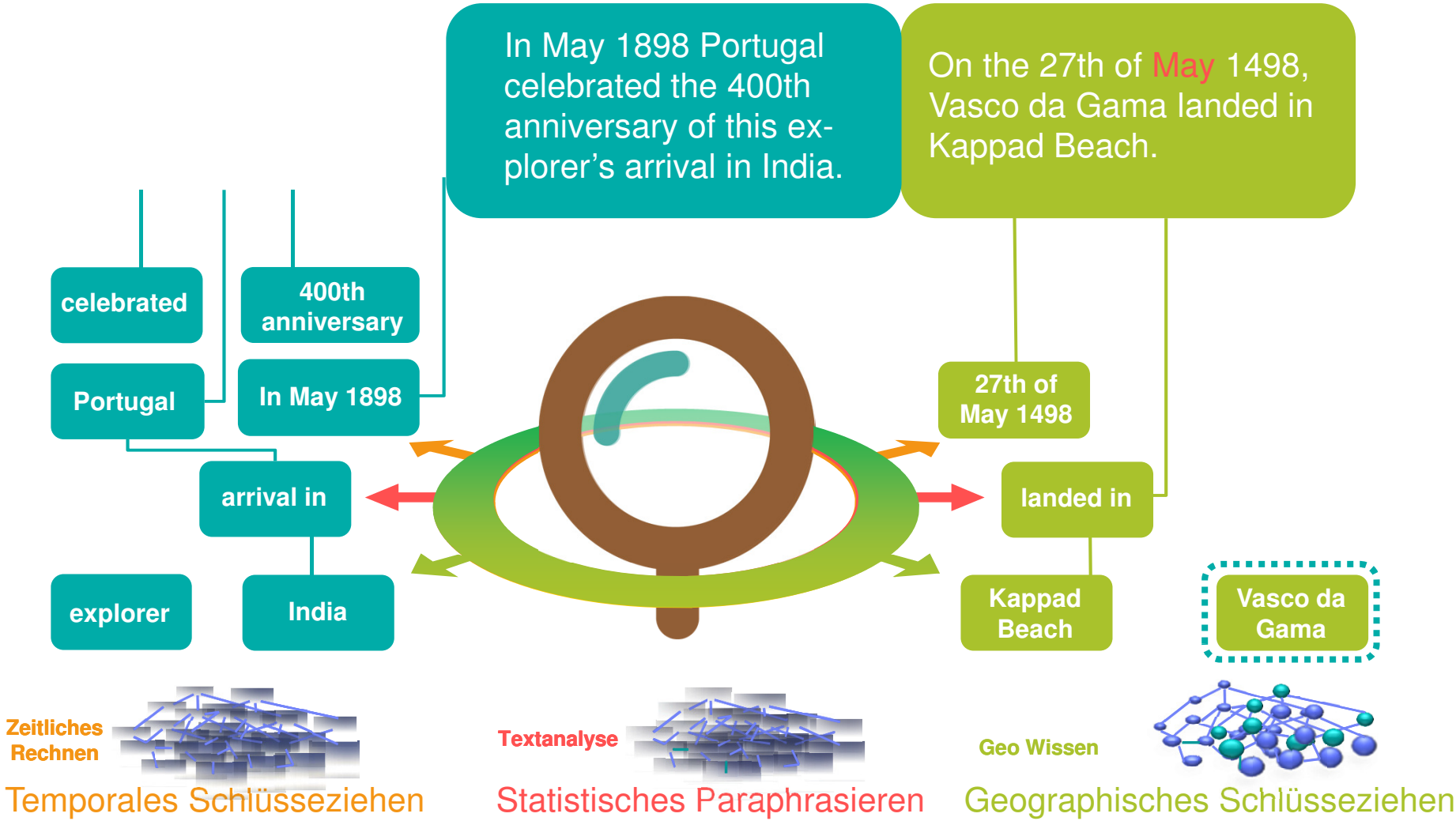


Der „Google-Ansatz“: Wortsuche



Wortsuche: Gary ist der Endecker Indiens ???

Tiefere Analyse

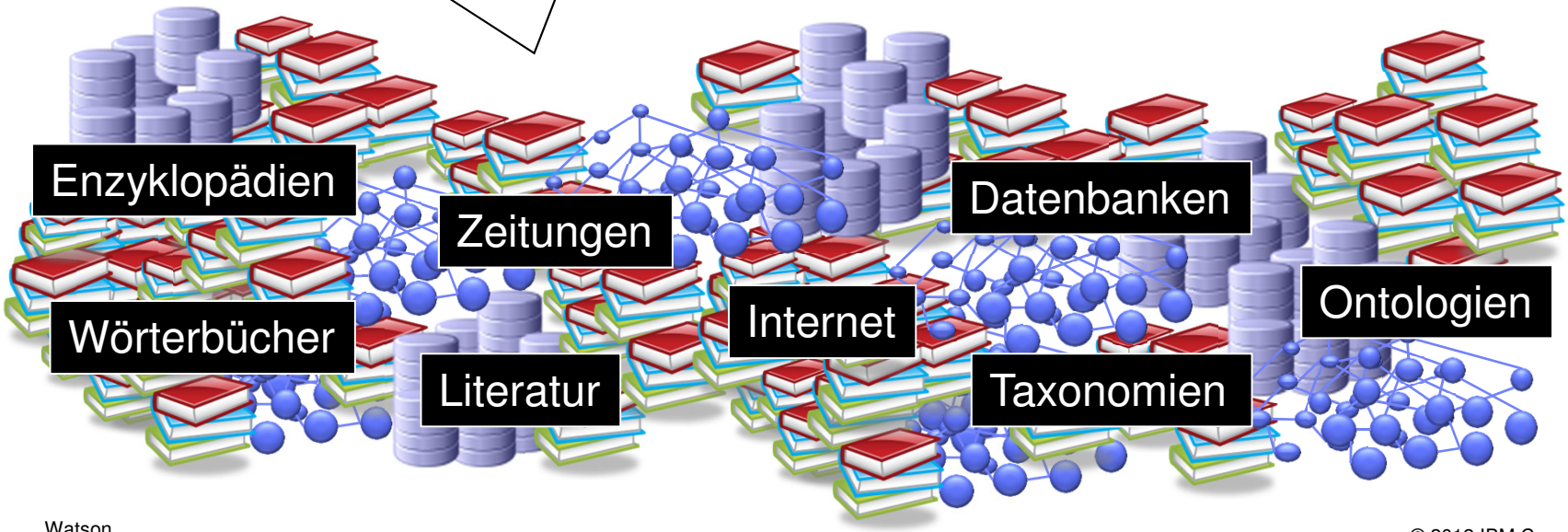


Grundidee: Fragebeantwortung aus „angelesenem“ Wissen

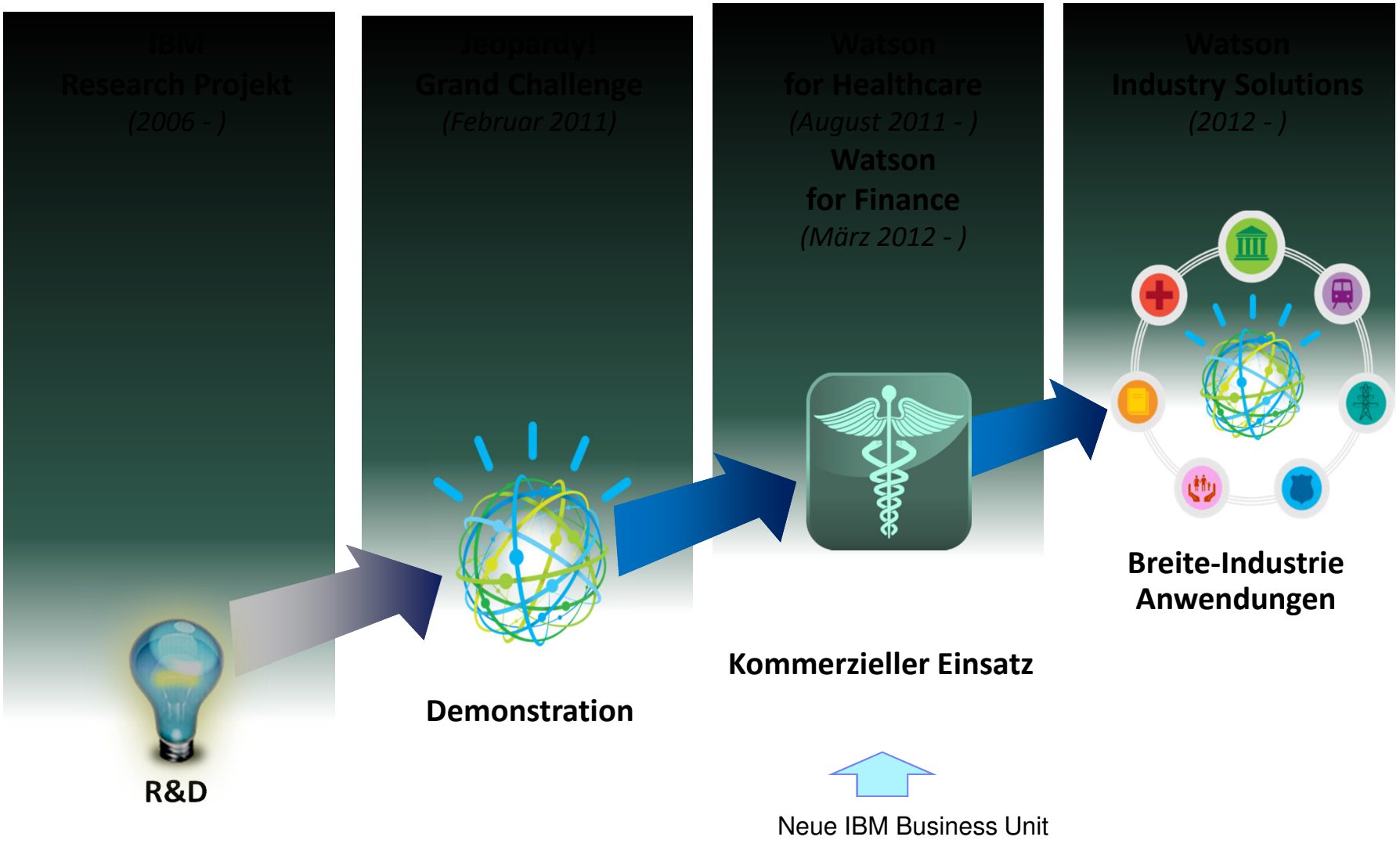
In May 1898 Portugal celebrated the 400th anniversary of this explorer’s arrival in India

Welche Fragen sollen beantwortet werden?

Aus welchen Informationsquellen kann ich Antworten auf diese Fragen bekommen?



Eine kurze Geschichte von IBM Watson



Unter der Haube – Was steckt in IBM Watson?

System Spezifikation

- 2880 Processing Cores
- 90 IBM P750 Server
- 16 Terabytes Speicher (RAM) – 20TB Disk
- 80 Teraflops (80 Trillionen Operationen pro Sekunde)
- Workload Optimized Systems

IBM Technologien

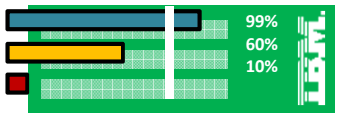
- Content Analytics
- Business Analytics
- Big Data
- Databases / Data Warehouses

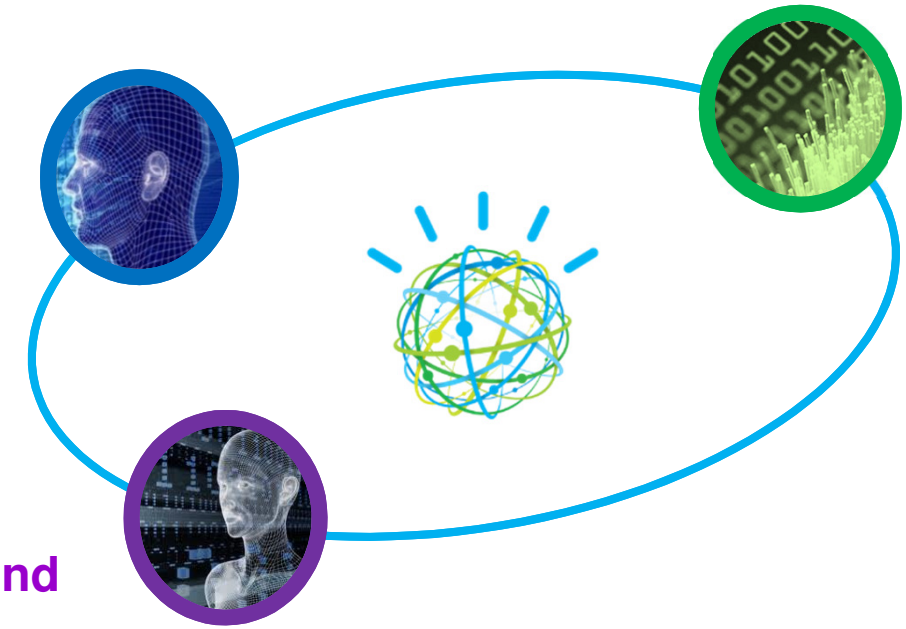
In den letzten 5 Jahren hat IBM über $14 Mrd für Aquisitionen im Bereich Analytics und $6 Mrd jährlich für R&D ausgegeben

IBM Watson verwendet eine Kombination umwälzender Technologien um optimierte Ergebnisse zu erzeugen

1 **Versteht natürliche, menschliche Sprache**

2 **Generiert und evaluiert Hypothesen für optimierte Ergebnisse**



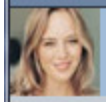


3 **Adaptiert und lernt aus Nutzerverhalten und Antworten**

…baut auf eine massiv parallele probabilistische Evidenz-basierte Architektur auf, die optimiert ist für POWER7

Patients

Patient Record



Samantha Darren - March 23, 2012

History of Present Illness

Patient has red eye with pain, inflammation, blurred vision, floating spots and sensitivity to light.

Symptoms

Question

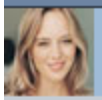
What condition has red eye, pain, inflammation, blurred vision, floating spots and sensitivity to light?

Evidence | Ask Watson

Answer

Patients

Patient Record



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Patient has red eye with pain, inflammation, blurred vision, floating spots and sensitivity to light.

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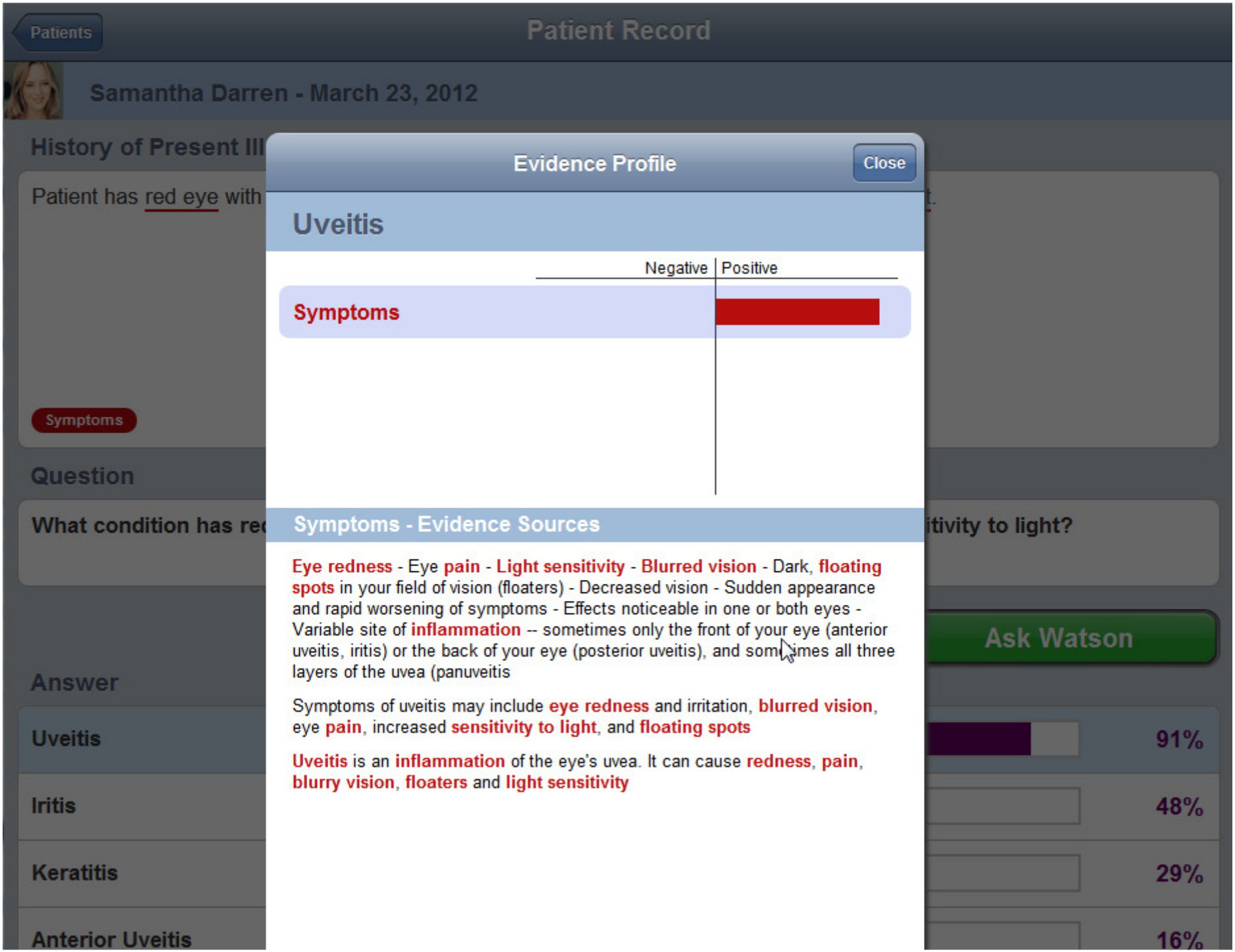
Question

What condition has red eye, pain, inflammation, blurred vision, floating spots and sensitivity to light?

Evidence | Ask Watson

Answer

Uveitis	91%
Iritis	48%
Keratitis	29%
Anterior Uveitis	16%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itivity to light?
Ask Watson
Answer
Uveitis
91%
Iritis
48%
Keratitis
29%
Anterior Uveitis
16%
Evidence Profile
Close
Uveitis
Negative
Positive
Symptoms
Symptoms - Evidence Sources
Eye redness - Eye pain - Light sensitivity - Blurred vision - Dark, floating spots in your field of vision (floaters) - Decreased vision - Sudden appearance and rapid worsening of symptoms - Effects noticeable in one or both eyes - Variable site of inflammation -- sometimes only the front of your eye (anterior uveitis, iritis) or the back of your eye (posterior uveitis), and sometimes all three layers of the uvea (panuveitis
Symptoms of uveitis may include eye redness and irritation, blurred vision, eye pain, increased sensitivity to light, and floating spots
Uveitis is an inflammation of the eye's uvea. It can cause redness, pain, blurry vision, floaters and light sensitivity

Zusammenarbeit in der Krebsbekämpfung

Krebs ist die Krankheit mit der zweithöchsten Todesrate

1 von 4
Personen sterben and Krebs

3X
Höhere Kostensteigerung bei Krebs vs. anderen Krankheiten

20%
Aller Krebsfälle erhalten anfänglich eine falsche Diagnose

18B
…en für Krebs in den USA in 2010

$$$$$$$$$
$$$$$$$$$
$$$$$$$$$

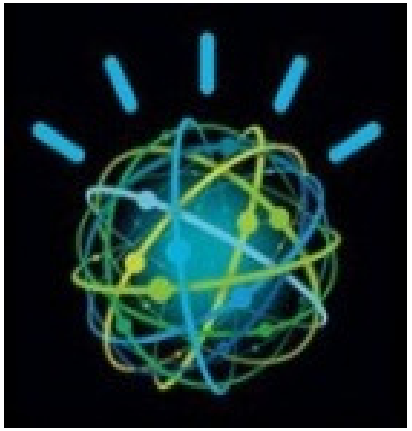
IBM

Cancer (US ONLY)	2011 New Cases (est.)	2011 Deaths	%
Respiratory	239320	161250	28%
Digestive	277570	139250	24%
Genital	338620	63980	11%
Breast	232620	39970	7%
Urinary	132900	28970	5%
Lymphoma	75190	20620	4%
Leukemia	44600	21780	4%
Oral	39400	7900	1%
Other	216450	88230	16%
TOTAL	1,596,670	571,950	100%

IBM

Working Together to Beat Cancer

Anwendungsbeispiel: IBM und Wellpoint arbeiten zusammen um Watson im Gesundheitsbereich produktiv einzusetzen

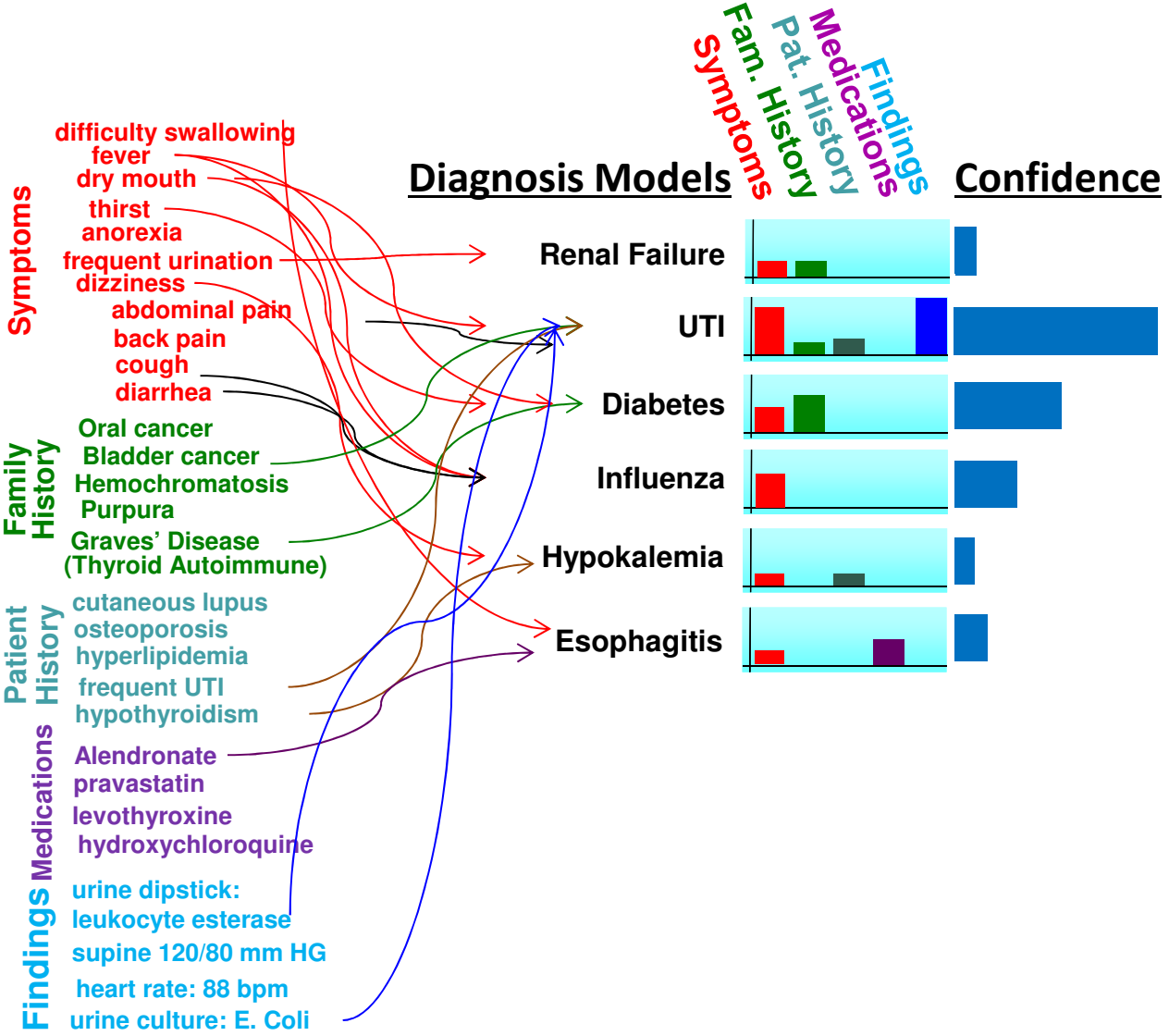
WELLPOINT +  =

Nutzen medizinischer Akten + **Schnelle Diagnose und Behandlung** + **Verbesserte Qualität der Krankenfürsorge**

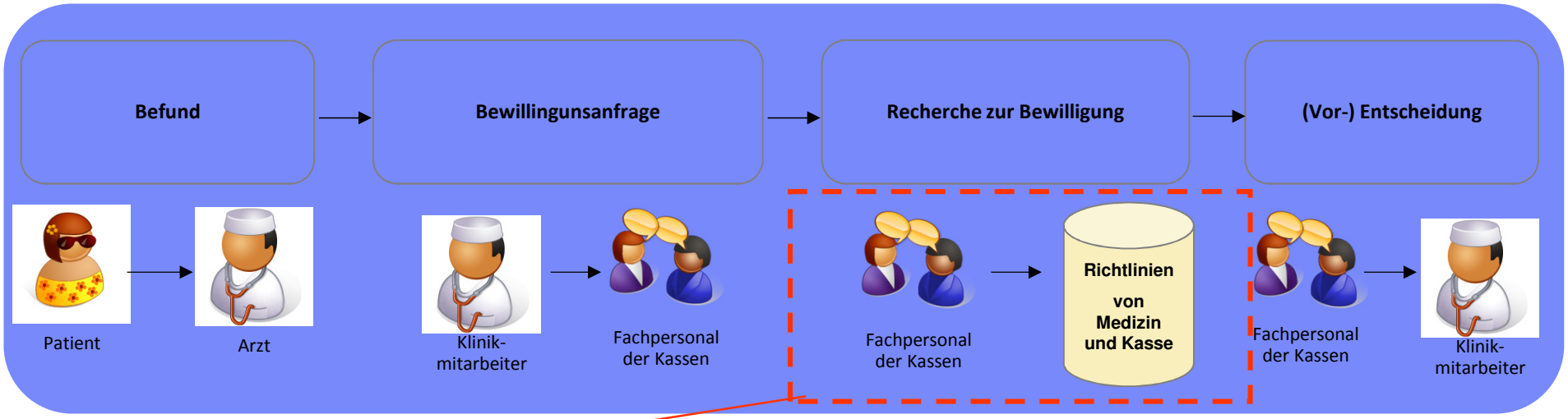
"Imagine having the ability within three seconds to look through all of that (medical) information….at the moment you're caring for that patient."

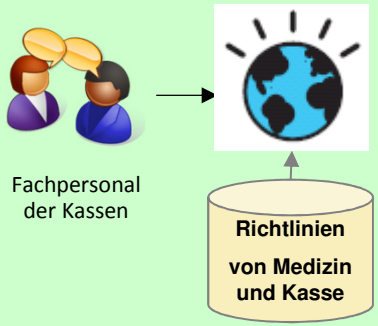
Dr. Sam Nussbaum, WellPoint's Chief Medical Officer, WellPoint

Beispielhafter Ablauf einer Watson Diagnose



Mehr als nur Diagnoseunterstützung: Optimierung von Bewilligungsprozessen

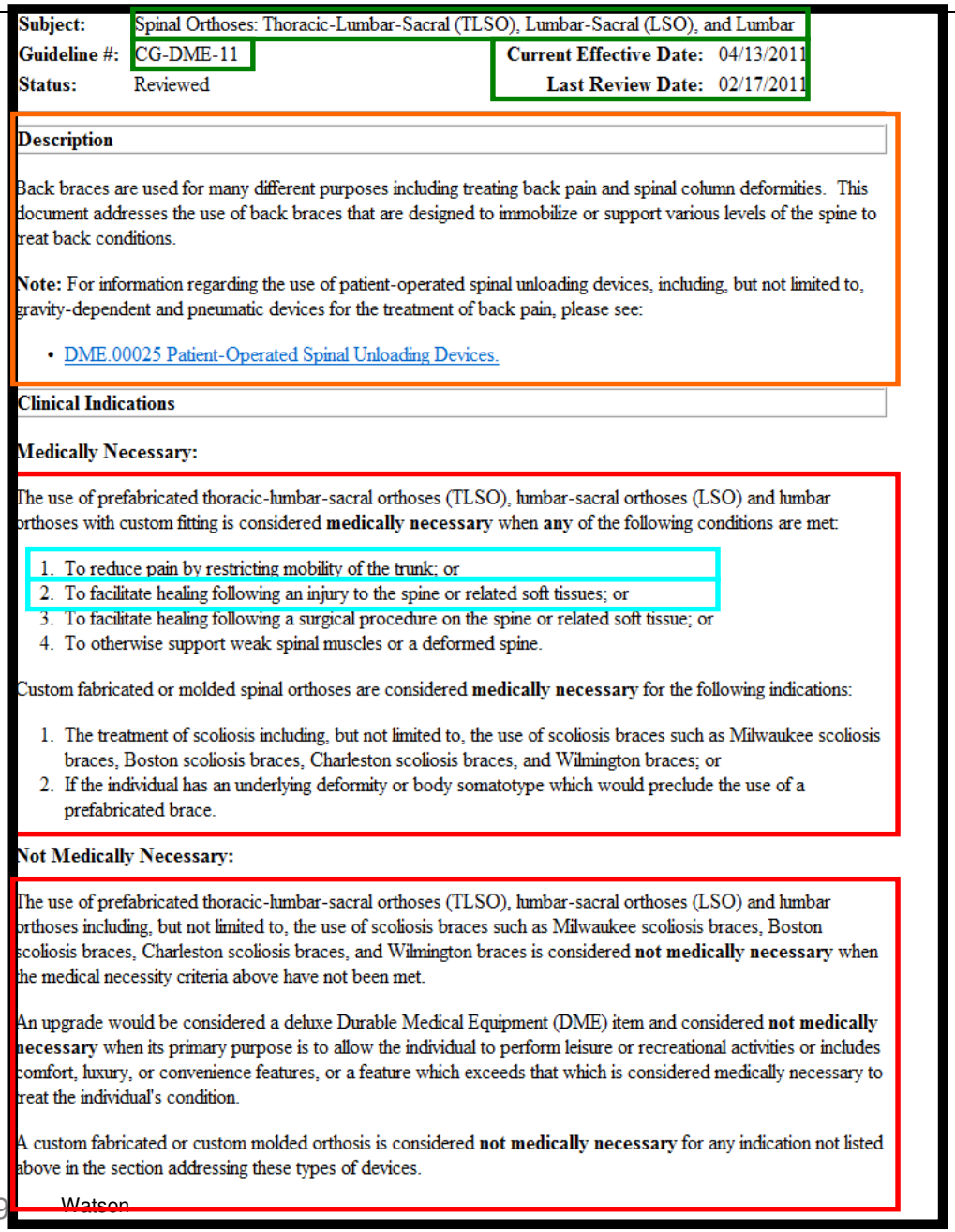




- Über 1000 Fachmitarbeiter
- Über 10.000 Anfragen am Tag
- Jeder Mitarbeiter bearbeitet ca. 30 Anfragen am Tag
- Signifikante Kosten

Ziele

- Verbesserung von Effektivität & Effizienz (10 – 25%) mit ensprechenden Einsparungen
- Erhöhte Konsistenz der Entscheidungen
- Schnellere Bearbeitungszeiten
- Erhöhte Zufriedenheit der Versicherten



Subject: Spinal Orthoses: Thoracic-Lumbar-Sacral (TLSO), Lumbar-Sacral (LSO), and Lumbar
Guideline #: CG-DME-11
Status: Reviewed
Current Effective Date: 04/13/2011
Last Review Date: 02/17/2011

Description

Back braces are used for many different purposes including treating back pain and spinal column deformities. This document addresses the use of back braces that are designed to immobilize or support various levels of the spine to treat back conditions.

Note: For information regarding the use of patient-operated spinal unloading devices, including, but not limited to, gravity-dependent and pneumatic devices for the treatment of back pain, please see:

- DME.00025 Patient-Operated Spinal Unloading Devices.

Clinical Indications

Medically Necessary:

The use of prefabricated thoracic-lumbar-sacral orthoses (TLSO), lumbar-sacral orthoses (LSO) and lumbar orthoses with custom fitting is considered **medically necessary** when **any** of the following conditions are met:

1. To reduce pain by restricting mobility of the trunk; or
2. To facilitate healing following an injury to the spine or related soft tissues; or
3. To facilitate healing following a surgical procedure on the spine or related soft tissue; or
4. To otherwise support weak spinal muscles or a deformed spine.

Custom fabricated or molded spinal orthoses are considered **medically necessary** for the following indications:

1. The treatment of scoliosis including, but not limited to, the use of scoliosis braces such as Milwaukee scoliosis braces, Boston scoliosis braces, Charleston scoliosis braces, and Wilmington braces; or
2. If the individual has an underlying deformity or body somatotype which would preclude the use of a prefabricated brace.

Not Medically Necessary:

The use of prefabricated thoracic-lumbar-sacral orthoses (TLSO), lumbar-sacral orthoses (LSO) and lumbar orthoses including, but not limited to, the use of scoliosis braces such as Milwaukee scoliosis braces, Boston scoliosis braces, Charleston scoliosis braces, and Wilmington braces is considered **not medically necessary** when the medical necessity criteria above have not been met.

An upgrade would be considered a deluxe Durable Medical Equipment (DME) item and considered **not medically necessary** when its primary purpose is to allow the individual to perform leisure or recreational activities or includes comfort, luxury, or convenience features, or a feature which exceeds that which is considered medically necessary to treat the individual's condition.

A custom fabricated or custom molded orthosis is considered **not medically necessary** for any indication not listed above in the section addressing these types of devices.

Watson

Wissensbasis: Beispiel Clinical Guideline / Medical Policy Dokument

- Semi-strukturiertes Dokument
  - Relevante Meta-Daten wie Gültigkeitzeitraum
- Erkennen, Verständnis, Abgleich relevanter Abschnitte mit Anfrage
  - Massnahmenbeschreibung
  - Indikation
  - Medizinische Notwendigkeit
  - Umstände/Bedingungen
  - ...

Beispielanfrage

Beispiel

Eingabe

Fall ID	*Diagnosen Code*	*Massnahmen Code*
0200201156	410.82	E0617

Request for an Automated External Defibrillators for Home Use (E0617) for a 56 year old member with history of MI with cardiac arrest 7 months ago. Has a previously implanted ICD that required removal due to infection. The plan is to reinsert the ICD once the infection has been resolved.

Ausgabe

Pend to Physician
86% confidence
Request is not for a wearable defibrillator, but for an automated External Defibrillator, which per DME.00032 reads: Automated external defibrillators for home use are considered **investigational and not medically necessary.**

Vom Gewinn einer Quizshow zur Transformation dessen wie Unternehmen denken, handeln und operieren

Gesundheit

Diagnose/Behandlungs-unterstützung, Evidenz-basierte Entscheidungs-unterstützung

Finanzen

Investitionsplanung, Institutional Trading und Entscheidungsunter-stützung

Contact Center

Call Center und Tech-Support, Wissens-management, Kundenverständnis

Öffenliche Hand

Öffentliche Sicherheit, Informationsverteilung, Aufklärung

IBM Watson bringt das Potential grosse Herausvorderungen für Unternehmen und Gesellschaft zu meistern

Q&A

Vielen Dank für Ihre Aufmerksamkeit!

IBM Watson: Jeopardy! Beispielfragen

Kategorie: „Cambridge“

Mit viel „Gravitas“ wurde dieser Jünger der Dreifaltigkeit 1669 der Lucasian Professor für Mathematik?

Wer ist Isaac Newton?

Beispielfrage für Doppeldeutigkeit

Kategorie:
Mach dir keine Sorgen

Du brauchst nur ein Nickerchen! Du hast nicht diese Schlafstörung, die dazu führen kann, dass man im Stehen einschläft.

Was ist Narkolepsie?

Beispielfrage für Fachfrage

Kategorie: Sprichwörter

Sogar eine kaputte von diesen an der Wand stimmt zwei mal am Tag.

Was ist eine Uhr?

Beispielfrage für Rätsel