



Computer statt Ärzte ?!

Decision support als «Freind» des Arztes



Dr.med. Marc Oertle
Facharzt Innere Medizin, MSc HIM
Leitender Arzt
Spital Thun, CH

Topics Decision Support & Ärzte

- Mini-Intro
- 6 Thesen wieso Ärzte durch Computer ersetzt werden sollten
- 6 Mythen in Bezug auf den Einsatz von decision support Systemen
- Zusammenfassung / Konklusion

Die Spital S_{immental}-T_{hun}-S_{aanenland} AG



- Betten 300
- Inpatients/a: 17'000
- Outpatients/a: 55'000
- Vollzeitstellen 1'100
- Pflorgetage 98'000

These 1

- Der Arzt ist zunehmend überfordert, mit der Informationsvielfalt und der Komplexität in der Medizin umzugehen
- Der Computer nicht

Informationsflut

- Publikationen PubMed (limit: Mensch) im letzten Jahr:
 - 314 076 (860/d)
 - 11'300 davon RCT, 1920 davon Metaanalysen
- Im eigenen Fachgebiet als relevant bezeichnet:
 - 10-20 Artikel /d: Lesen, begreifen, kritisch einschätzen, umsetzen...
- Interaktions-Warnungen Spital Thun (15'000 inpatients) 2012
 - 174'050
 - Davon 10'523 schwerwiegend oder mittelschwer (28/d)
 - 10 häufigste Medis:
Interaktionen mit 196 Medikamentengruppen
 - Gar nicht zu reden von den Nebenwirkungen



These 1: Der Arzt ist zunehmend überfordert

Komplexität und Wissen

- Personalisierte Medizin
 - Pharmakogenetik
 - Genomics, Proteomics, Metabolomics...
 - E-Health und p-health =?
- Halbwertszeit des medizinischen Wissens: 5 a
- *„As research advances, about half of what we will teach you will turn out to be wrong.
The problem is, we presently don't know which half.“*

Powerful Medicines, Jerry Avorn, 2004

Leistungsfähigkeit

Ein moderner Computer kann 10 Billionen
Rechenoperationen pro Sekunde ausführen

These 2

- Der Arzt entscheidet oft irrational, nicht-evidenz-basiert, intuitiv und individuell (Individual-based Medicine IBM)
- Der Computer kann das gar nicht
 - IBM für EBM statt IBM als EBM



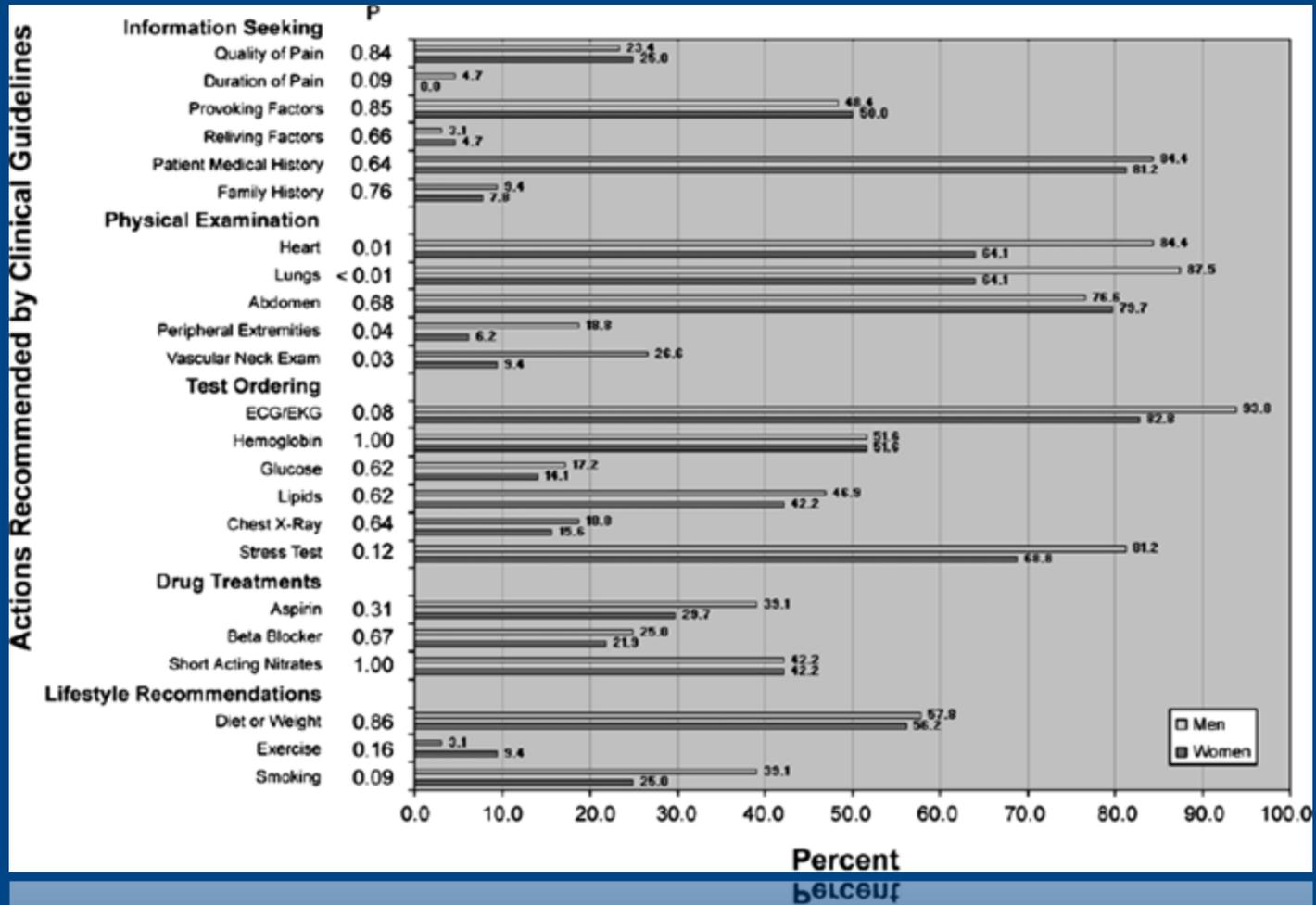
IBM statt EBM

- Ärzte handeln zu oft nicht evidenz-basiert
- „gut feeling“, Gewohnheiten, „da war doch was“
- Durchschnittliche Adherence 55%*

* Gaps between knowing and doing: Understanding barriers to optimal health care. Cochrane LJ, JCEHP 2007

These 2: Der Arzt entscheidet zu irrational und zu individuell

These 2: IBM statt EBM



These 2: Der Arzt entscheidet irrational und individuell

These 3

- Ärzte sind sich selten einig und zeigen eine grosse inter-individuelle Variabilität
- Jeder Computer rechnet gleich

Bsp: Herz-Ultraschall

Clinical study

Analysis of interinstitutional observer agreement in interpretation of dobutamine stress echocardiograms

Rainer Hoffmann MD^a, Harald Lethen MD^a, Thomas Marwick MD,FACC^b, Mariarosaria Arnese MD^c, Paolo Fioretti MD^c, Alessandro Pingitore MD^d, Eugenio Picano MD^d, Thomas Buck MD^e, Raimund Erbel MD,FACC^e, Frank A. Flachskampf MD^a and Peter Hanrath MD,FACC^a

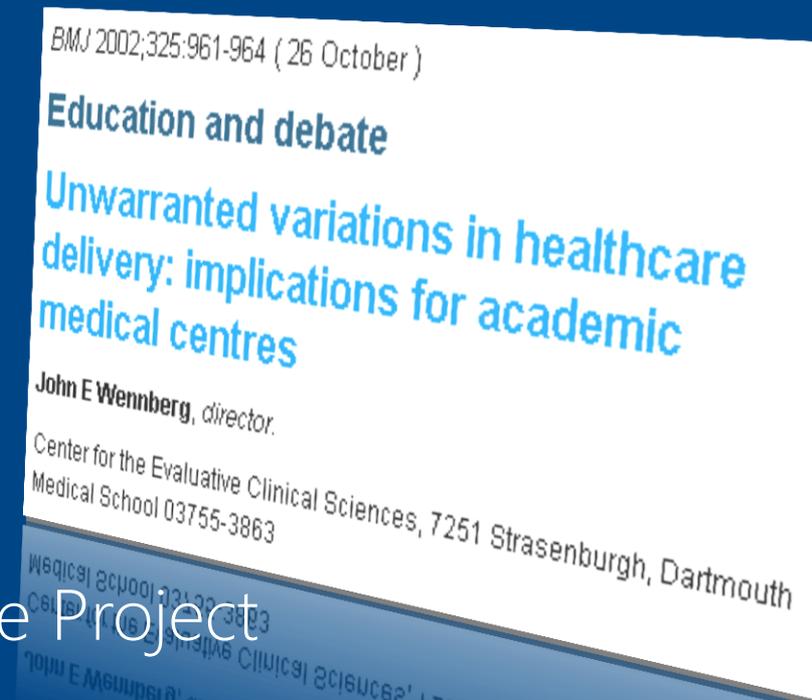
Am J Cardiol 1998

Overall agreement: 73%

- Range 61-82% je nach Ausmass der KHK
- Positiv-negativ Aussage: 41-100%

These 3: Die Ärzte zeigen eine zu grosse Variabilität

The Dartmouth Atlas of HealthCare



The Dartmouth Atlas of Health Care Project

- 3436 Spitäler
- Zusammengezogen in 300 Spitalregionen
- Patienten-match nach Krankheiten, Schweregrad, Demographische Daten, Co-Morbiditäten ...

These 3: Die Ärzte zeigen eine zu grosse Variabilität

Auszüge aus Dartmouth Atlas

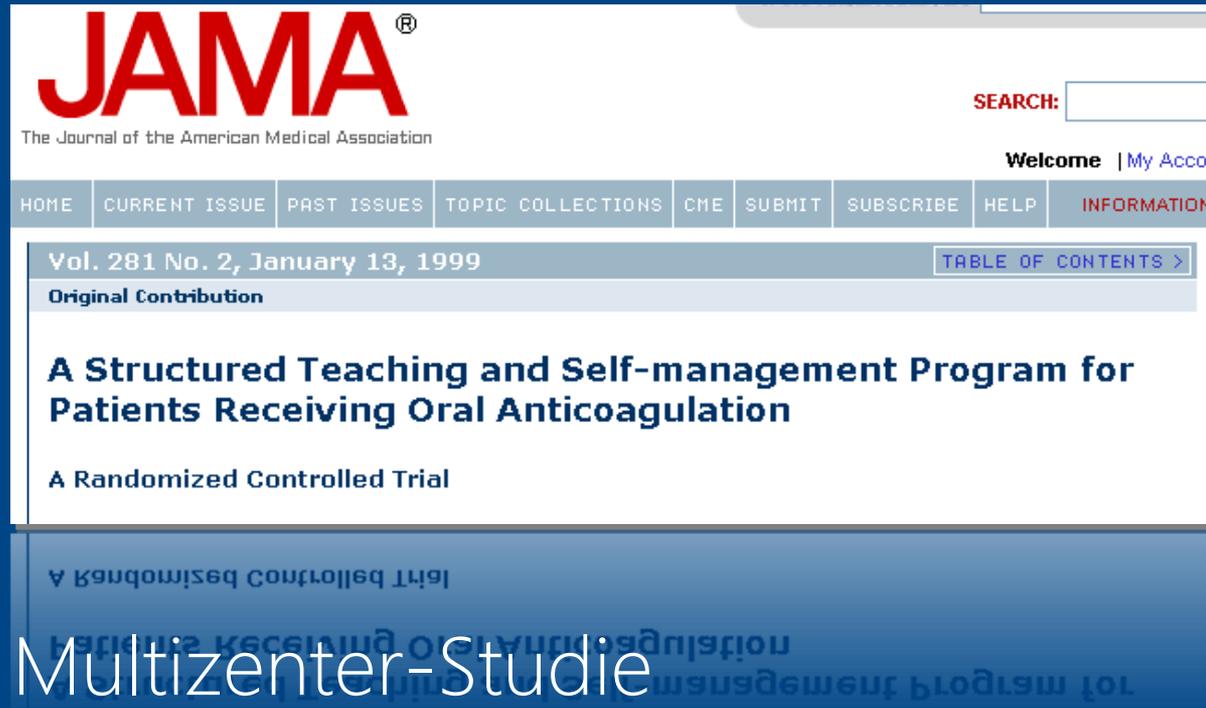
- Beta-Blocker nach Herzinfarkt:
 - *Beste Spitalregion 83%, schlechteste 40%*
- Bypass vs. „Ballon-Dilatation“ (PTCA)
 - *In New Haven Chance für ACB mehr als doppelt so gross als in Boston*
- Gebärmutter-Entfernung
 - *In New Haven nur halb so häufig empfohlen wie in Boston*
- HbA1c-Messung (Langzeit-Zucker) bei Diabetikern
 - In Vermont 92%/a und in Alaska 71%/a
- Notfall (amb. oder stationär möglich), vergleichbare Population
 - in Hawaii 31/1000 wieder nach Hause geschickt, der Rest stationär
 - in West Virginia 118/1000 wieder nach Hause geschickt

These 3: Die Ärzte zeigen eine zu grosse Variabilität

These 4

- Der Patient versorgt sich mit der Hilfe von Computern, Internet und Web-2 selbst und braucht den Arzt gar nicht

„Blut-Verdünner“



- Randomisierte Multizenter-Studie
- Signifikant bessere Einstellung:
 - weniger sub/supratherapeutische Ziel-Werte (INR)
 - weniger Abweichung vom durchschnittlichen Ziel-Wert

These 4: Der Patient versorgt sich dank eHealth selbst

Live better, together!™

making healthcare better for everyone through sharing, support, and research

 **learn**
about living with & treating your condition

 **connect**
with others who share your experiences

 **track**
your history & progress for access anywhere



[Join now — It's FREE](#)

OR: what can we help you with?



OR: what can we help you with?



These 4: Der Patient versorgt sich dank eHealth selbst

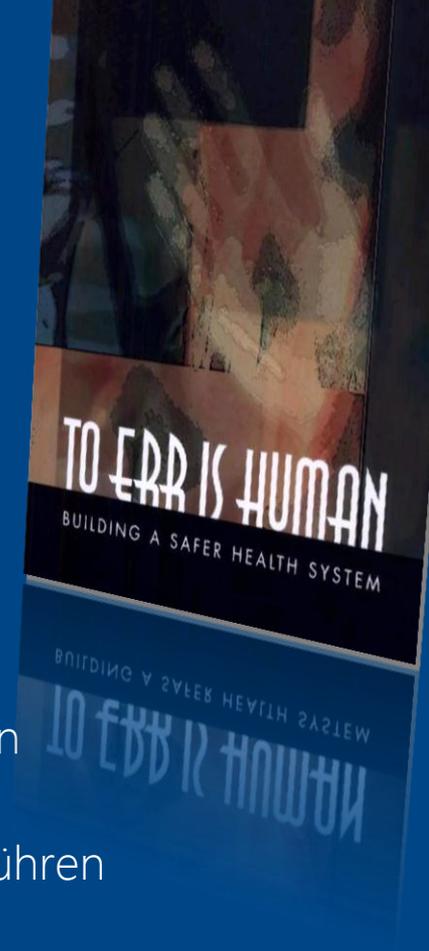
These 5

Der Arzt macht zu viele Fehler

Der Computer nicht

Fehler-Häufigkeiten

- Harvard Medical Practice Study
 - 30' 121 Krankengeschichten überprüft
 - AE in 3.7% der Hospitalisationen (Vgl. Utah: 2.9%)
 - 13% davon führten zum Tod
 - 70% davon nur zu geringen, nicht bleibenden Schäden
 - 28% waren auf Nachlässigkeit/Fahrlässigkeit zurückzuführen
 - » 22%-34% je nach Schweregrad der Folgen!
 - 58% davon wären vermeidbar



These 5: Der Arzt macht zu viele Fehler

Krämer vs Krämer

Samuel G. Campbell · Daphne D. Murray
Ammar Hawass · David Urquhart
Stacy Ackroyd-Stolarz · David Maxwell

Agreement between emergency physician diagnosis and radiologist reports in patients discharged from an emergency department with community-acquired pneumonia

Received: 14 January 2005 / Accepted: 25 February 2005 / Published online: 4 May 2005

Received: 14 January 2005 / Accepted: 25 February 2005 / Published online: 4 May 2005

Notfall-Ärzte diagn. & (!) therapieren
Lungenentzündungen (CAP):

- 45% der XR-Befunde wurden durch Radiologen bestätigt
- 26% wurde ein andere Diagnose gestellt
- 21% der Bilder normal

These 5: Der Arzt macht zu viele Fehler

Computer vs Radiologen

doi:10.1093/brain/awm319

Brain (2008), 131, 681–689

Automatic classification of MR scans in Alzheimer's disease

Stefan Klöppel,^{1,2,*} Cynthia M. Stonnington,^{1,3,*} Carlton Chu,¹ Bogdan Draganski,¹ Rachael I. Scahill,⁵ Jonathan D. Rohrer,⁵ Nick C. Fox,⁵ Clifford R. Jack Jr,⁴ John Ashburner¹ and Richard S. J. Frackowiak^{1,6,7}

Jonathan D. Rohrer,⁵ Nick C. Fox,⁵ Clifford R. Jack Jr,⁴ John Ashburner,¹ and Richard S. J. Frackowiak,^{1,6,7} Stefan Klöppel,^{1,2,*} Cynthia M. Stonnington,^{1,3,*} Carlton Chu,¹ Bogdan Draganski,¹ Rachael I. Scahill,⁵

96% in der

Obduktion bestätigten Alzheimer Erkrankungen wurden ante mortem vom Computer korrekt diagnostiziert

89% aller Patienten wurden korrekt diskriminiert (AD, mögliche AD, normal)

Vergleichs-Sample durch Radiologen: 70-max 80% accuracy

These 5: Der Arzt macht zu viele Fehler

To err is computer?

Der Computer macht weniger Fehler
als der Mensch /Arzt

These 6

- Das Kerngeschäft des Arztes beherrscht der Computer auch:

Diagnosen stellen

Internist-I Miller et al (1982!)

Table 1. Interpretation of Evoking Strengths

| EVOKING STRENGTH | INTERPRETATION |
|------------------|----------------|
|------------------|----------------|

Table 2. Interpretation of Frequency Values.

| FREQUENCY | INTERPRETATION |
|-----------|----------------|
|-----------|----------------|

Table 3. Interpretation of Import Values.

| IMPORT | INTERPRETATION |
|--------|--|
| 3 | 1 Manifestation is usually unimportant, occurs commonly in normal persons, and is easily disregarded |
| 4 | 2 Manifestation may be of importance, but can often be ignored; context is important |
| 5 | 3 Manifestation is of medium importance, but may be an unreliable indicator of any specific disease |
| | 4 Manifestation is of high importance and can only rarely be disregarded as, for example, a false-positive result |
| | 5 Manifestation absolutely must be explained by one of the final diagnoses |

| CATEGORY | INTERNIST-I | CLINICIANS no. of instances |
|---|-------------|--------------------------------|
| <i>Total possible diagnoses</i> | 43 | 43 |
| Definitive, correct | 17 | 23 |
| Tentative, correct | 8 | 5 |
| Failed to make correct diagnosis | 18 | 15 |
| Definitive, incorrect | 5 | 8 |
| Tentative, incorrect | 6 | 5 |
| Total no. of incorrect diagnoses | 11 | 13 |
| Total no. of errors in diagnosis | 29 | 28 |

- Ca 500 Krankheitsprofile
- Ca. 3600 Symptome
- Evoking strength/Frequency/Import

These 6: Der Computer diagnostiziert so gut wie der Arzt

ISABEL: what a wonderful world

ORIGINAL ARTICLE

ISABEL: a web-based differential diagnostic aid for paediatrics: results from an initial performance evaluation

P Ramnarayan, A Tomlinson, A Rao, M Coren, A Winrow, J Britto

Arch Dis Child 2003;**88**:408–413

See end of article for authors' affiliations

Correspondence to:
Dr J Britto, Department of Paediatrics, Imperial College School of Medicine, St Mary's Hospital, Norfolk Place, London W2 1PG, UK;
j.britto@ic.ac.uk

Accepted
4 October 2002

Aims: To test the clinical accuracy of a web based differential diagnostic tool (ISABEL) for a set of case histories collected during a two stage evaluation.

Methods: Setting: acute paediatric units in two teaching and two district general hospitals in the south-east of England. Materials: sets of summary clinical features from both stages, and the diagnoses expected for these features from stage I (hypothetical cases provided by participating clinicians in August 2000) and final diagnoses for cases in stage II (children presenting to participating acute paediatric units between October and December 2000). Main outcome measure: presence of the expected or final diagnosis in the ISABEL output list.

Results: A total of 99 hypothetical cases from stage I and 100 real life cases from stage II were included in the study. Cases from stage II covered a range of paediatric specialties ($n = 14$) and final diagnoses ($n = 55$). ISABEL displayed the diagnosis expected by the clinician in 90/99 hypothetical cases (91%). In stage II evaluation, ISABEL displayed the final diagnosis in 83/87 real cases (95%).

Conclusion: ISABEL showed acceptable clinical accuracy in producing the final diagnosis for a variety of real as well as hypothetical case scenarios.

These 6: Der Computer diagnostiziert so gut wie der Arzt

Computer statt Ärzte ?!

http://www.extinctanimal.com/



[Twilight](#)
Stephenie Meyer
New \$6.04



[Brisong](#)
Christopher Paolin...
New \$15.13

e x t i n c t a n i m a l

[Home](#)

[Prehistoric](#)

[Gallery](#)

[Cloning](#)

[The Coelacanth](#)

[The Thylacine](#)



[Mammals](#)

[Birds](#)

[Reptiles](#)

[Amphibians](#)

[Fish](#)

[Resources](#)

Welcome to ExtinctAnimal.com



Aber....

Mortalitätsreduktion/Morbiditätsreduktion durch eHealth?

-> fehlende Evidenz

Wer spricht mit dem Patienten?

Wer stellt dem Patienten die richtigen/wichtigen Fragen?

Wer gibt gute Daten in das Computersystem ein?

Wie gut sind Datengrundlagen für CDSS ?

von Mythen und Fakten....

Mythos Guideline

...systematically developed statements to assist practitioner and patient decisions about appropriate health care for specific clinical circumstances...

...user-friendly statements that bring together the best external evidence and other knowledge necessary for decision-making about a specific health problem...

Lokale Adaptation, Grundlage für klinische Pfade

Die eine Wahrheit: Therapie-Treue

| | | | | | |
|--------------------------------|----------------|-------------|---------------|---------|-----------|
| • Herzinsuffizienz-Behandlung: | GAI-3: ACE/ARB | Betablocker | Spironolacton | | |
| • Herzinsuffizienz-Behandlung: | GAI-5: ACE/ARB | Betablocker | Spironolacton | Digoxin | Diuretika |
| • MAHLER-Survey 2005 | GAI-3 | | 60% | | |
| | GAI-5 | | 63% | | |
| • ADHERE registry 2005 | GAI-3 | | 57% | | |
| | GAI-5 | | 62% | | |
| • Thun 2008 | GAI-3 | | 70% | | |
| | GAI-5 | | 60% | | |
| • Thun_corrected* | GAI-3c | | 80% | | |
| | GAI-5c | | 80% | | |
| • Thun_adjusted# | GAI-3c/a | | 90% | | |
| | GAI-5c/a | | 90% | | |

*Korrektur: Niereninsuffizienz, Allergien, schwere COPD, Bradykardie

*Anpassungen: klinische Zustände, Ungewissheit, Polypharmazie, Non-compliance, Co-Morbiditäten

Mythos 1: Die gute Guideline

| Reasons for non-adherence | Frequency | Items | Representative answer |
|---------------------------|-----------|---|---|
| Clinical constraints | 54 | Low blood pressure; renal function (impaired, unstable); low heart rate | "I'm very well aware that—given the cardiac function—this patient should have at least an ACE inhibitor or ARB, given the NYHA score an aldosterone antagonist and maybe digoxin as well; but facing the renal function that worsens additionally, I really cannot give them now." |
| Uncertainty | 21 | Timing; sizing at initialisation of treatment; rapidly improving symptoms; unpredictability; risk-benefit calculations; strength of evidence vs applicability | "This patient was just confronted with the diagnosis of CHF. We do not know for how long his heart did not work well and I don't know how he will react on our drugs. What should I do now? Should I give him every recommended drug in the guideline or should I step up with the most important ones and look how he reacts? The guideline does not tell you that." "I simply do not have any facts supporting me in predicting the level of decrease in renal function when I would now increase the dosage of the diuretics or even add another drug. If we lose even more renal function, this patient could end on dialysis and this would not be an easy task given the hypotension he showed the last months." |
| Omission/errors | 15 | Drug choice; dosing; missing data (NYHA score) | "I simply did not think of spironolacton as being a possibility in this patient, although I would have known that it would be indicated in CHF and NYHA IV stadium. Indeed, the patient could profit from this add-on because he did not do that well the last months." |
| Patient factors | 10 | Co-morbidity; compliance (patient); polypharmacy; conflicts with other guidelines/prioritisation | "I don't believe that. I knew that the patient was hospitalised already twice this year for the same reason (worsening symptoms of CHF). But every time we increase some drugs, the patient's getting better and the GP decreases it again. And with the next hospitalisation the game starts from scratch. We should really recommend to leave the regimen on this level! On the other side, the GP had his reasons for this action..." |
| Trajectory associated | 4 | Inpatient ↔ outpatient setting GP vs hospital | "From the GP and the discussions with the patient, we know that he will take not even half of the drugs we prescribe. So we try to limit the amount of drugs and we just give him the most powerful ones." |

Mythos 1: Die gute Guideline

Mythos Patientenpfade

Welche Krankheit ? Welche Behandlung? Eine ? Mehrere ?
Welche Parameter ? Welche Meilensteine ?

Disziplinär ? Interdisziplinär ?
Institutions-intern ? Institutionsübergreifend?

Ziele: Kostenreduktion? Transparenz? Prozessoptimierung?
Prozesssteuerung (pre-/posthoc)?

- ...haben wir, weil der Fortschritt der Genesung und die Prognose hochgradig unvorhersehbar sind, VRT aufgegeben. Die genuine Varianz ist zu gross und der Doku-Aufwand wird überdimensional...

Evidence-based pathways?

Cochrane Review (2005)

Hirnschlag

15 Studien, nur 3 randomisiert, insgesamt 4421 Patienten

Kein signifikanter Unterschied für

Mortalität,

Unterstützungsbedarf bei Entlassung (Trend pro PW)

Langzeit-Institution

Entlassung nach Hause

Komplikationen (Pneumonie, HWI)

Bildgebende Verfahren (Trend gegen Pw)

RE-Hospitalisationen

Lebensqualität, Zufriedenheit

Kosten

Mythos 2: Patientenpfade machen alles besser

Mythos Evidenz / EBM

ICD-10
Co-Morbidität
Heterogenität
Individualität
Personalized medicine
Guideline-Architektur
Multi-Morbidität
Studienqualität
Disease-oriented
Polypharmazie

Sinn und Unsinn von Pfaden

Spital Thun, Patienten 2007-2009 mit Betriebsnormen/Richtlinien

Exazerbierte COPD und Inhalationen

Davon 187 mit Inhalationen ▪ **99%**

Status asthmaticus: 19, davon 18 mit Steroiden

1 Fall falsch kodiert (asthmoide Bronchitis) ▪ **100%**

Pneumonie (Antibiotika, Physiotherapie): 519

96% erhalten Physiotherapie, 98% Antibiotika (exkl. Exitus)

Mythos unbelehrbarer Arzt

Suche nach evidence : RCT, Meta-Analysen..

Continuous Medical Education

Guidelines auf lokaler, nationaler, internationaler Stufe

Morbiditäts- und Mortalitätskonferenzen

Scores, Therapierichtlinien, UpToDate erfreuen sich grösster Beliebtheit

Hohes Sicherheits-, Validitäts-, Qualitätsbedürfnis

Mythos 3: Der Arzt akzeptiert keinen decision support

Computer statt Ärzte?! • Dr.med. • Marc Oertle • eHealthSummit Austria

Selbstverständnis des Arztes

Wohl des Patienten als höchstes Gut

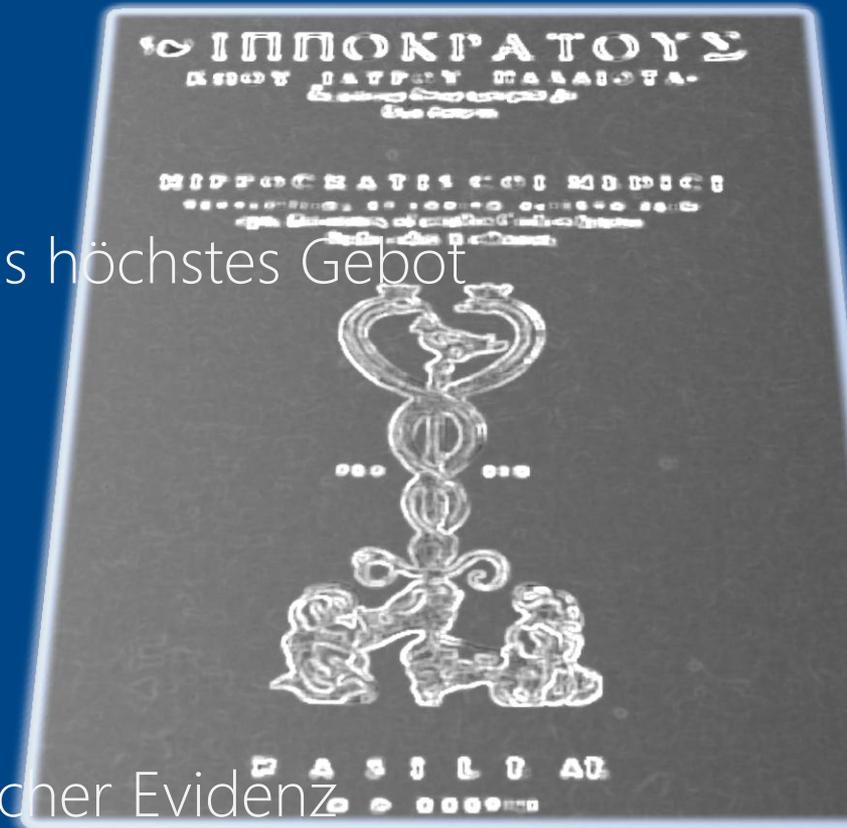
Primum nihil nocere

Schutz der Patienteninformationen als höchstes Gebot

Höchste Behandlungsqualität

Höchstmögliche Empathie

Bestmögliche Anwendung bestmöglicher Evidenz



Mythos 4: Der Arzt akzeptiert keinen decision support

Mythos technophober Arzt

iPhone Verbreitung unter Ärzteschaft

Lindbergh Operation

Medizintechnische Errungenschaften



Digital intelligence blog

Pharma insight on digital marketing, social media, mobile apps, online video, websites and interactive healthcare tools



by Dominic Tyer

Twenty six per cent of European doctors own an iPad

And they spend over a quarter of their professional online time on the device, according to new research

15th February 2012

From: Marketing

Share

Tweet 1

+1 4

SONICWALL
in 3

Print Friendly

Mythos 5: Der Arzt will Technik nicht nutzen

Computer statt Ärzte?! • Dr.med. • Marc Oertle • eHealthSummit Austria

Attitude of Physicians Towards Automatic Alerting in Computerized Physician Order Entry Systems*

A Comparative International Survey

M. Jung¹; A Hoerbst^{1, 2}; W. O. Hackl¹; F. Kirrane³; D. Borbolla⁴; M. W. Jaspers⁵; M Oertle⁶; V Koutkias⁷; L. Ferret^{8, 9}; P. Massari¹⁰; K. Lawton¹¹; D. Riedmann¹; S. Darmoni¹⁰; N. Maglaveras⁷; C. Lovis¹²; E. Ammenwerth¹

¹Institute of Health Informatics, Department of Biomedical Informatics and Mechatronics, UMIT – University for Health Sciences, Medical Informatics and Technology, Hall in Tirol, Austria; ²Research Division for eHealth and Telemedicine, UMIT – University for Health Sciences, Medical Informatics and Technology, Hall in Tirol, Austria; ³Department of Medical Physics and Bioengineering, Galway University Hospital, Galway, Ireland; ⁴Health Informatics Department, Hospital Italiano de Buenos Aires, Buenos Aires City, Argentina; ⁵Centre for Human Factors Engineering of Health Interactive Technology (HIT-lab), Department of Medical Informatics, Academic Medical Center – University of Amsterdam, Amsterdam, The Netherlands; ⁶Medical Informatics and Department of Internal Medicine, Hospital of Thun, Thun, Switzerland; ⁷Lab of Medical Informatics, Medical School, Aristotle University of Thessaloniki, Greece; ⁸Pharmacy Department, Hospital of Denain, Denain, France; ⁹EA2694, University Hospital of Lille, Lille, France; ¹⁰CIS-MeF & TIBS team, LITIS EA 4108, Rouen University Hospital, Normandy, France; ¹¹IT, Medical Technology and Telephony Services of Capital Region, Copenhagen, Denmark; ¹²Division of Medical Information Sciences, University Hospitals of Geneva and University of Geneva, Geneva, Switzerland

Keywords

Medical order entry systems, clinical decision support systems, attitude, questionnaires, alerting

2,600 physicians in eleven hospitals from nine countries to participate. Eight of the hospitals had different CPOE systems in use, and three of the participating hospitals were not using a CPOE system.

benefits of alerting medication safety. be better adapted to make use of more present alert information

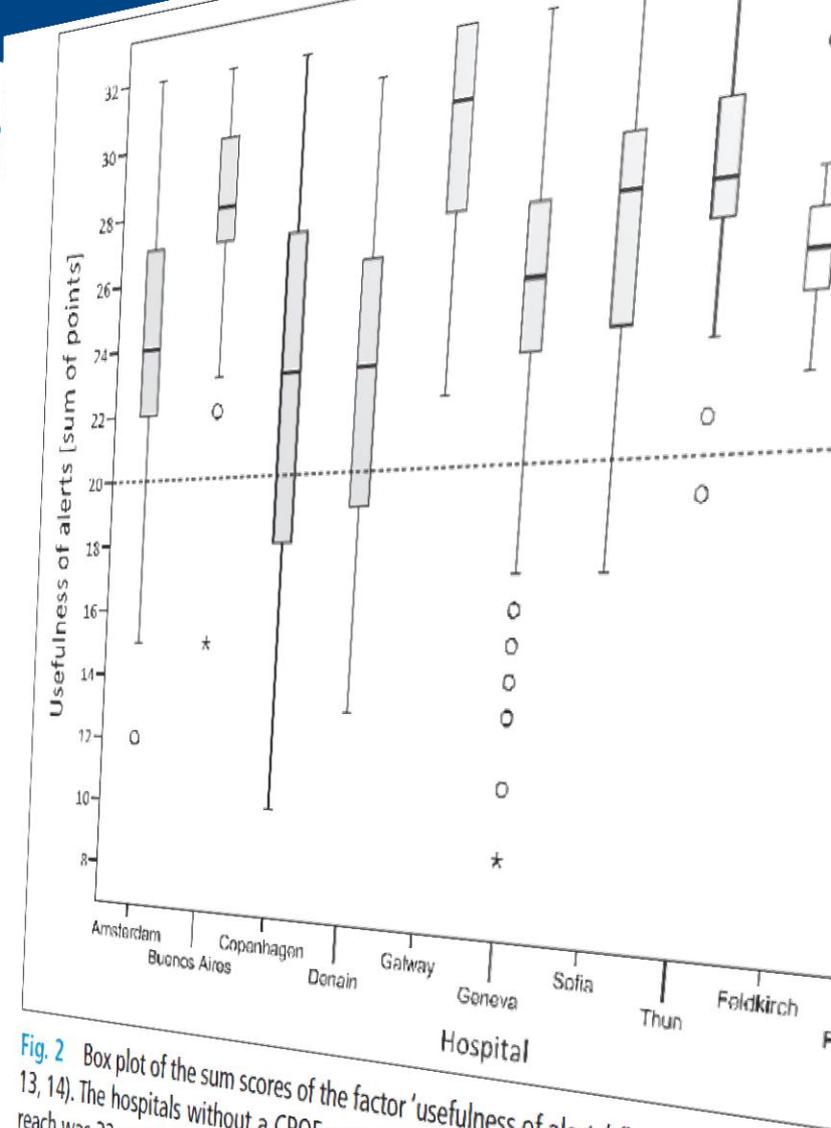


Fig. 2 Box plot of the sum scores of the factor 'usefulness of alerts' (based on the items 13, 14). The hospitals without a CPOE system are indicated with white boxes. The maximum reach was 32 points; the minimum score was 8 points. The horizontal dotted line indicates a mean of 20 points. Scores below this line indicate negative attitudes; scores above this line indicate positive attitudes.

Mythos 4: Der Arzt will...

Computer statt Arzt?!, Dr. med. Marc Oertle • eHealth Summit

Mythos Reifegrad CDS

Tiefer PPP -> Alert fatigue im Bereich Interaktionen

CDS zielgruppengerichtet (Student – 1. klinisches Jahr – Facharzt – Spitalarzt – Praxisarzt)

CDS patientenadaptiert (klinische Werte, laborchemische Werte, Co-Morbiditäten, Resistenzdaten, personalized medicine)

Zeitabhängigkeit (welches Teammitglied wie oft mit welchem Alert/Support konfrontieren, Schichtwechsel, fehlendes Triggerevent)

Benefit-Risk-Abwägungen einer Intervention

Implementation! Probleme im IT & soziotechnischen Umfeld, Unterhalt

Mythos 6: CDS sind reif für den Alltag

Mythos Reifegrad CDS (2)

Interaktionen zwischen unterschiedlichen CDS(S)

Unterhalt der Regeln, der Knowledge Base, Knowledge-mgmt. Lifecycle

Context-sensitive reasoning

Fragmentierte Entscheidungen

Governance for clinical decision support: case studies and recommended practices from leading institutions Adam Wright, Sittig, Ash, Bates,
J Am Med Inform Assoc 2011;18:2 187-194

50 Years of Informatics Research on Decision Support: What's next ?
Mitchell, Gerdin, Lovis, Miller, Shortliffe
Methods Inf Med 6/11: 525-535

Mythos 6: CDS sind reif für den Alltag

Frequency and nature of drug-drug interactions in a Swiss primary and secondary acute care hospital

Table 2

All cases with at least one drug prescription between 2006 and 2010 are indicated. The number of prescriptions and the number of drug-drug-interactions (DDI) are outlined as overall sum and as distribution within the DDI severity categories (until 2009 four categories with results, for the last two months of 2009 and for 2010 five categories with results). Category 6 (newly defined in 2009) has no DDI in the entire study period and thus the row is not outlined. The same figures are given for the three different clinics (internal medicine, surgery and orthopaedics, gynaecology and obstetrics).

prescriptions (#/case): number of prescriptions and number of prescriptions per in-hospital stay

| Year | #Cases | # prescriptions (#/case) | #DDI / #prescriptions (%) | # DDI(#/case) | Category 1 (%) | Category 2 (%) | Category 3 (%) | Category 4 (%) | Category 5 (%) |
|-------------------------------|--------|--------------------------|---------------------------|---------------|----------------|----------------|----------------|----------------|----------------|
| 2006 | 11,682 | 187,794 (16) | 26 | 49,537 (4) | 2,890 (6) | 32,681 (66) | 11,159 (23) | 2,807 (6) | 0 (0) |
| 2007 | 13,332 | 217,742 (16) | 30 | 60,224 (5) | 3,027 (5) | 35,200 (58) | 12,170 (20) | 3,827 (6) | 0 (0) |
| 2008 | 13,235 | 211,897 (16) | 30 | 61,224 (5) | 3,881 (6) | 21,250 (35) | 8,020 (13) | 6,473 (11) | 0 (0) |
| 2009 | 14,110 | 231,992 (16) | 30 | 61,224 (5) | 3,881 (6) | 21,250 (35) | 8,020 (13) | 6,473 (11) | 0 (0) |
| 2010 | 15,170 | 258,450 (17) | 30 | 61,224 (5) | 3,881 (6) | 21,250 (35) | 8,020 (13) | 6,473 (11) | 0 (0) |
| Internal medicine | | | | | | | | | |
| 2006 | 2,863 | 60,027 (21) | 46 | 11,224 (9) | 1,881 (5) | 21,250 (68) | 8,020 (26) | 6,473 (10) | 0 (0) |
| 2007 | 3,314 | 67,979 (21) | 46 | 11,224 (9) | 1,881 (5) | 21,250 (68) | 8,020 (26) | 6,473 (10) | 0 (0) |
| 2008 | 3,573 | 73,160 (20) | 46 | 11,224 (9) | 1,881 (5) | 21,250 (68) | 8,020 (26) | 6,473 (10) | 0 (0) |
| 2009 | 3,885 | 79,218 (20) | 46 | 11,224 (9) | 1,881 (5) | 21,250 (68) | 8,020 (26) | 6,473 (10) | 0 (0) |
| 2010 | 4,459 | 88,362 (20) | 46 | 11,224 (9) | 1,881 (5) | 21,250 (68) | 8,020 (26) | 6,473 (10) | 0 (0) |
| Surgery /Orthopaedics | | | | | | | | | |
| 2006 | 6,996 | 107,900 (15) | 26 | 28,313 (4) | 2,890 (6) | 32,681 (66) | 11,159 (23) | 2,807 (6) | 0 (0) |
| 2007 | 8,021 | 127,940 (16) | 30 | 38,676 (5) | 3,027 (5) | 35,200 (58) | 12,170 (20) | 3,827 (6) | 0 (0) |
| 2008 | 7,635 | 117,730 (15) | 30 | 35,319 (5) | 3,027 (5) | 35,200 (58) | 12,170 (20) | 3,827 (6) | 0 (0) |
| 2009 | 8,064 | 129,770 (16) | 30 | 38,676 (5) | 3,027 (5) | 35,200 (58) | 12,170 (20) | 3,827 (6) | 0 (0) |
| 2010 | 8,461 | 145,370 (17) | 30 | 43,611 (5) | 3,027 (5) | 35,200 (58) | 12,170 (20) | 3,827 (6) | 0 (0) |
| Gynaecology/Obstetrics | | | | | | | | | |
| 2006 | 1,823 | 19,847 (11) | 6 | 1,375 (1) | 47 (3) | 1,038 (75) | 290 (20) | 0 (0) | 0 (0) |
| 2007 | 1,997 | 21,822 (11) | 6 | 1,375 (1) | 47 (3) | 1,038 (75) | 290 (20) | 0 (0) | 0 (0) |
| 2008 | 2,027 | 21,003 (10) | 6 | 1,375 (1) | 47 (3) | 1,038 (75) | 290 (20) | 0 (0) | 0 (0) |
| 2009 | 2,161 | 23,002 (11) | 6 | 1,375 (1) | 47 (3) | 1,038 (75) | 290 (20) | 0 (0) | 0 (0) |
| 2010 | 2,250 | 24,712 (11) | 6 | 1,375 (1) | 47 (3) | 1,038 (75) | 290 (20) | 0 (0) | 0 (0) |

| Category 1 DDI | Frequency of DDI (%) |
|---------------------------------|----------------------|
| Potassium-spirolacton | 2,894 (69) |
| Spirolacton-nutriflex* | 936 (22) |
| Cardiazon-nutriflex* | 145 (3) |
| Others+ (11) | 111 (3) |
| total | 2,883 (100) |
| Category 3 DDI | |
| Betablocker-betamimetics | 8,856 (11) |
| Spirolactone-ACE-inhibitors/ARB | 7,661 (10) |
| Acetylsalicylate-enoxaparine | 4,891 (6) |

Overruling von 71% aller Grad 1-3 Interaktionen durch ein paar wenige, einfache Regeln (2012: 7'493/10'523)

Konklusion

- Computer sind nicht in der Lage, Ärzte zu ersetzen
- Ärzte sind immer weniger in der Lage, effiziente und qualitativ hochwertige Arbeit ohne ICT zu leisten
- Ärzte sind generell technophil, Wissens-fokussiert und sehr kritikfähig
- Prinzipiell sehr gute Grundbedingungen für CDS-2-HP
- Fehler können mit CDS vermieden werden
- Fehler können durch CDS auch entstehen, Soziotechnischer Kontext!

Konklusion

- Ablehnung von CDS ist meist begründet/berechtigt
- Ablehnung von CDS hängt direkt mit dem Reifegrad des CDS zusammen
- Kontextbezug, Sens. /Spez. , Zeitbedarf sind höchst kritisch und bei aktuell verfügbaren CDS oft allesamt inakzeptabel
- Less is more: Fokus steigert Akzeptanz, Benefit-Risk-Ratio gut
- Tailoring, tiering, reducing to the max: just do it!

Fragen ?



SGMI SSIM SSMI

Schweizerische Gesellschaft für Medizinische Informatik
Société Suisse d'Informatique Médicale
Società Svizzera d'Informatica Medica
Swiss Society for Medical Informatics

Swiss Society for Medical Informatics
Società Svizzera d'Informatica Medica

Besten Dank für Ihre Aufmerksamkeit!