Health Informatics

The Electronic Health Record

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Overview

- How Canada ranks in health informatics infrastructure
- Overview of the Electronic Health Record (EHR)
- EHR System Selection and Implementation
- EHR costs/benefits
- Case Studies – VistA, KP HealthConnect, Cerner
- Questions/Comments

Model Of Care

Health Informatics is now part of core competencies for American physicians

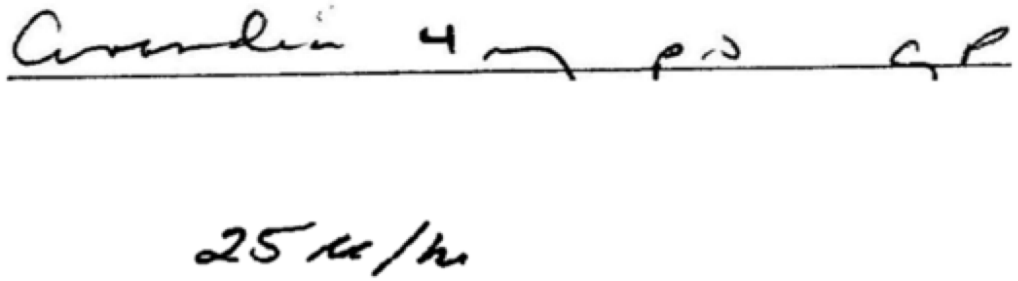
Limitations of Paper Records

- Single user – only one person can use the chart at a time
- Disorganized – especially for complex patients
- Incomplete – reports missing or lost, difficult in sharing information across providers
- Insecure – no audit trail, easily copied or stolen

Limitations of Paper Records

And then there is handwriting…

- Can you decipher these orders?



Comparison of Quality Measures (Davis, 2010)

Country Rankings	
	1.00–2.33
	2.34–4.66
	4.67–7.00

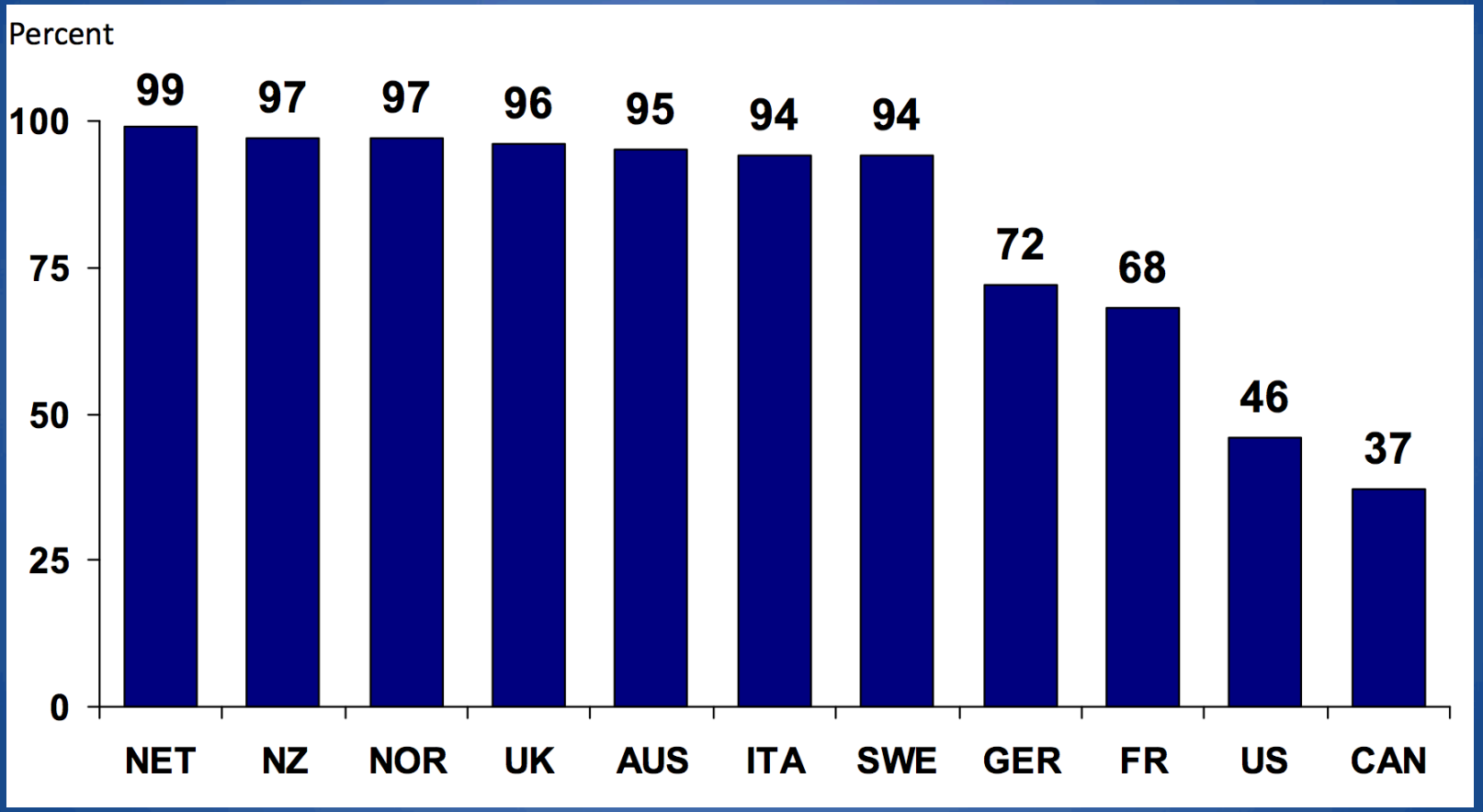




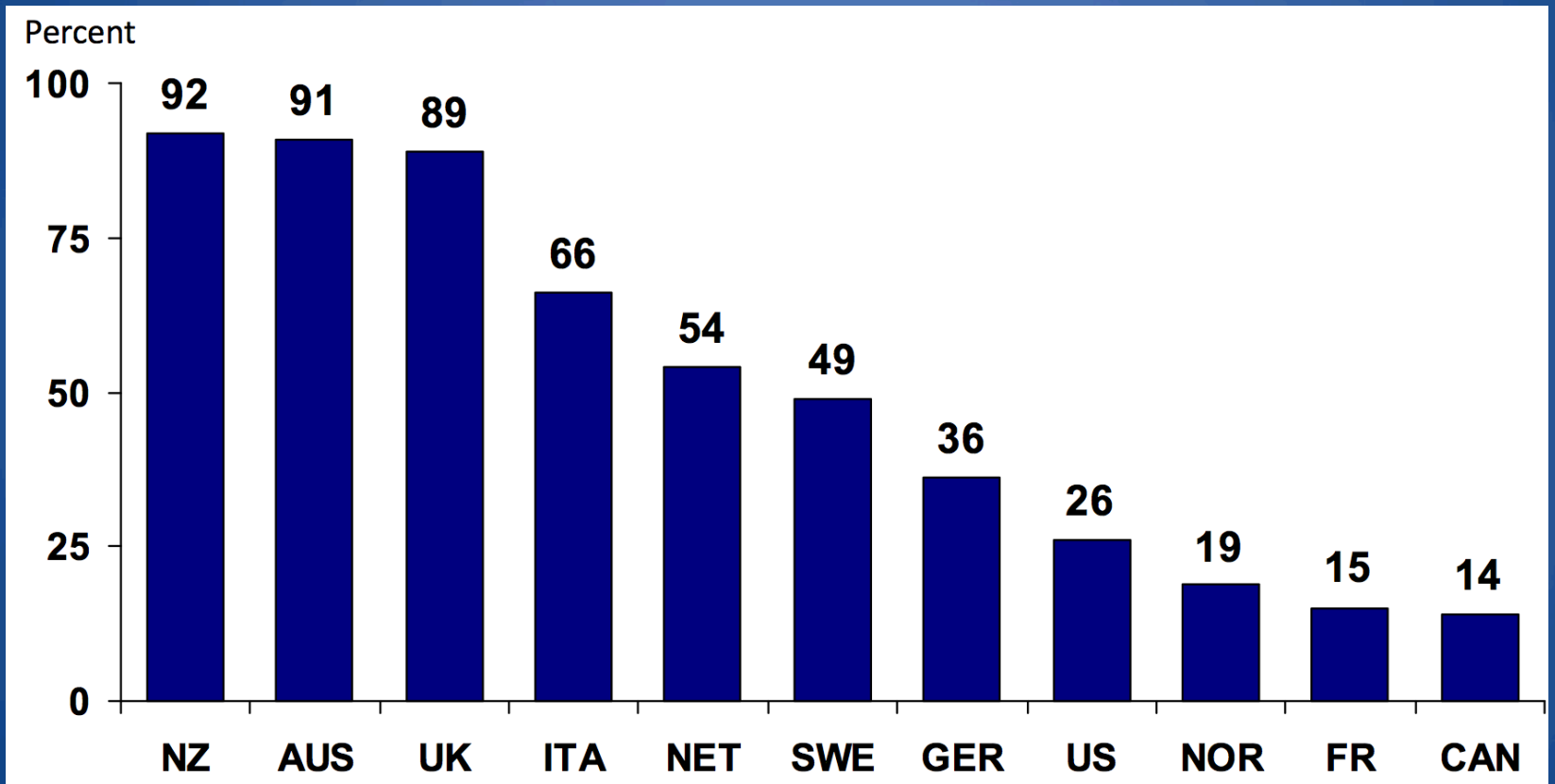


	AUS	CAN	GER	NETH	NZ	UK	US
OVERALL RANKING (2010)	3	6	4	1	5	2	7
Quality Care	4	7	5	2	1	3	6
Effective Care	2	7	6	3	5	1	4
Safe Care	6	5	3	1	4	2	7
Coordinated Care	4	5	7	2	1	3	6
Patient-Centered Care	2	5	3	6	1	7	4
Access	6.5	5	3	1	4	2	6.5
Cost-Related Problem	6	3.5	3.5	2	5	1	7
Timeliness of Care	6	7	2	1	3	4	5
Efficiency	2	6	5	3	4	1	7
Equity	4	5	3	1	6	2	7
Long, Healthy, Productive Lives	1	2	3	4	5	6	7
Health Expenditures/Capita, 2007	$3,357	$3,895	$3,588	$3,837*	$2,454	$2,992	$7,290

EHR usage in Primary Care (Schoen, 2009)

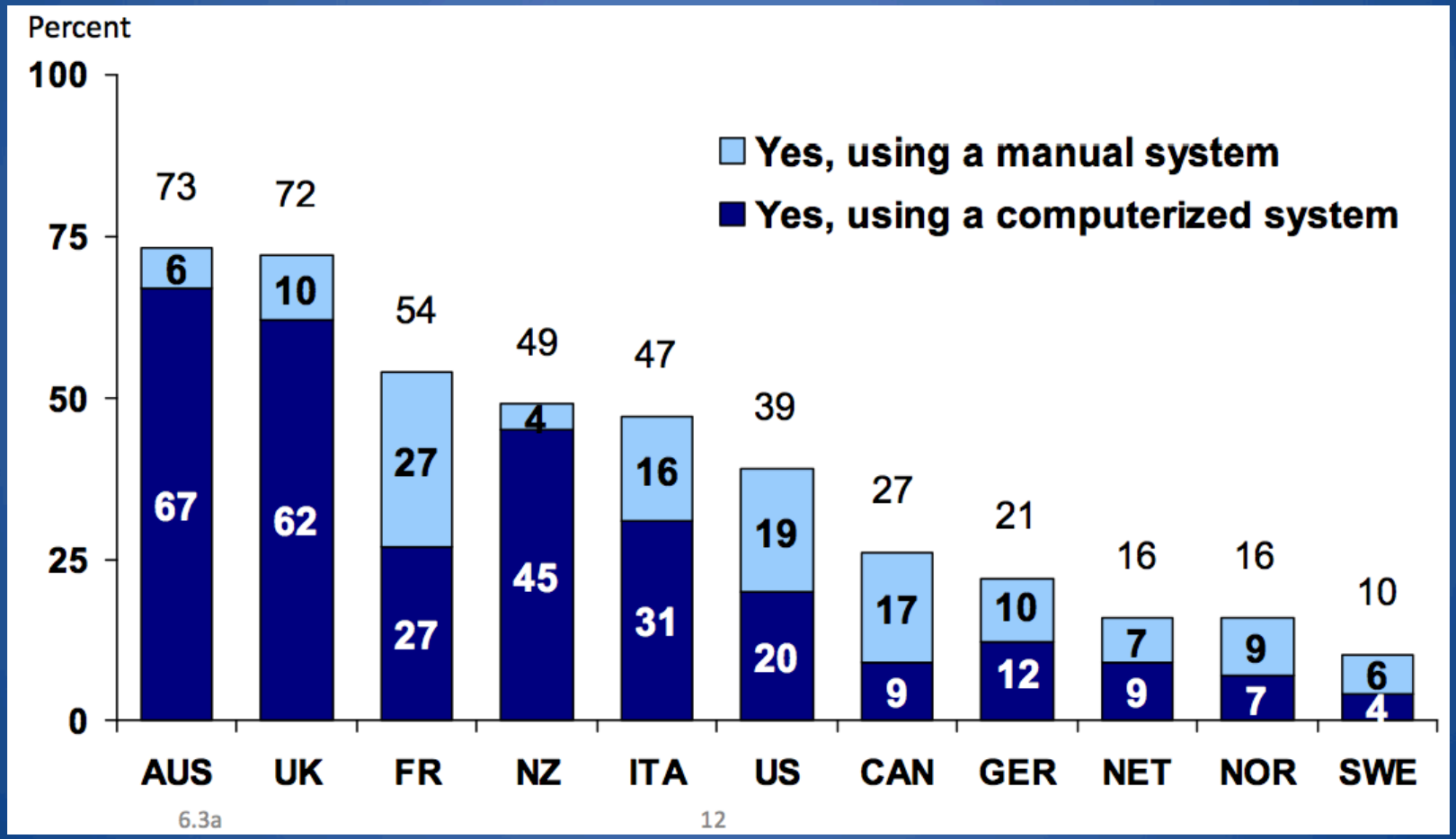


Physicians reporting at least 9 of 14 clinical IT functions (Schoen, 2009)



Count of 14 functions includes: electronic medical record; electronic prescribing and ordering of tests; electronic access test results, Rx alerts, clinical notes; computerized system for tracking lab tests, guidelines, alerts to provide patients with test results, preventive/follow-up care reminders; and computerized list of patients by diagnosis, medications, due for tests or

Physicians receive reminders for guideline based care



EHR Capabilities (Schoen, 2009)

Percent reporting ROUTINE:	AUS	CAN	FR	GER	ITA	NET	NZ	NOR	SWE	UK	US
Electronic ordering of laboratory tests	86	18	40	62	91	6	64	45	81	35	38
Electronic access to patients' test results	93	41	36	80	50	76	92	94	91	89	59
Electronic prescribing of medication	93	27	57	60	90	98	94	41	93	89	40
Electronic alerts/ prompts about a potential problem with drug dose/interaction	92	20	43	24	74	95	90	10	58	93	37
Electronic entry of clinical notes	92	30	60	59	82	96	96	81	89	97	42

Overview of EHR

2 general types of EHR:

1. Privately owned
2. Open source

Overview of EHR

1. Privately owned
- Cerner
- EPIC
- Allscripts (Sunrise)
- KP Connect (Kaiser Permanente)
- And many, many more...

Overview of EHR

2. Open Source

- VistA (Veterans Health Information Systems and Technology Architecture. www.hardhats.org
- OpenEHR – www.openehr.org
- Open EMR – www.openemr.org

EHR Selection & Implementation

- Overall complex, with no single solution & varying for different settings, specialties, etc.

- No shortage of info in the form of reports, articles, books, & guides. Some examples:
  - HITECH answers (www.hitechanswer.net)
  - MSP EHR selector (www.ehrselector.com)
  - KLAS (www.klasresearch.com)
  - Focus on Canada (canadianemr.ca)

Steps in System Selection

1. Planning
2. Organization of project
3. Request for proposal
4. Evaluation of systems
5. Selection of system
6. Contract negotiation

EHR Selection & Implementation

- Organizations should set their own goals and objectives, however much decision-making will now be driven by meaningful use & HITECH adoption incentives.

EHR Selection & Implementation

- Leadership and project management essential to success, as well as having buy-in from users.

- Many reasons for failure relate back to planning
  - Lack of clear vision
  - Lack of knowledgeable and experienced staff
  - Unrealistic expectations

EHR Selection & Implementation

- In terms of the Organization aspects, need a project team composed of:
  - Project manager – coordinates project
  - Project steering committee – responsible for implementing project, often led by CIO or CMIO
  - User task force – organizes and represents users
  - Vendor representative (if not using Open Source Software)
  - Consultant (s)

EHR Selection

- Should be made by the project team based on criteria established for institution's needs/ requirements

- Need to pay close attention to:
  - Cost – both for implementation and ongoing
  - Build your own/open-source vs buy/partner with a company
  - Interfaces with other systems

EHR Selection & Implementation

- Many important considerations in contract negotiations with vendor:
  - Delivery dates
  - Warranties and guarantees
  - Costs and payment terms
  - Who owns the data/transfer of data issues
  - Penalties
  - Maintenance and updates
  - Responsibilities in training of hospital staff

EHR Selection & Implementation

- Other issues to consider:
  - Security measures
  - Interface design/user friendliness & functionality
  - Training & testing
  - Go-Live (transition date from paper to EHR)

Major Challenges

Many, many challenges in EHR selection & implementation, however the common ones:

- Higher costs than budgeted
- Organizational dysfunction/Poor planning
- Value of clinical champions/importance of having the right people involved

Major Post-implementation issues

- "We bought the wrong EMR!"
- Need an exit strategy and "prenuptial agreement".
- Remember that the EHR industry is a $60 Billion industry…and EHR companies' primary objective is to make money.

Clinician Time

- Most vendors advise planning 10 to 15% decreased productivity for 3 to 6 months post-implementation of EHR before return to baseline.
- Research shows some activities take more time
- Other gains made elsewhere in provision of care.

Experiential concerns

- EHR use overall is not perfect and can cause harm, with some centers actually having reverted back to paper charting.

- New South Wales, Australia, statewide implementation of Cerner FirstNet in emergency departments – numerous unanticipated consequences, resulting in a number of reports of patient harm (Patrick, 2011)

Benefits and challenges of EHR

- Benefits (unit)
  - Improved physician, nursing, and other care (3)
  - Personal health records (3)
  - Clinical decision support (5)
  - Quality assessment (5)
  - Public health informatics (5)
  - Clinical research (5)
  - Health information exchange (5)
- Challenges (unit)
  - Data quality (3)
  - Data usability (3)
  - Standards and interoperability (4)
  - Privacy, confidentiality, and security (4)
  - Understanding clinical narrative text (4)
  - Implementation (6)

Financial benefits of EHR (HIMSS, 2007)

Cost savings

- Reduced redundancy in labs/diagnostic imaging
- Eliminated or reduced transcription services
- Less medical records space
- Reduced paper chart costs
- Lower staffing costs

Revenue enhancements

- Coding enhancements
- Enhanced bargaining with payers
- Research generation
- Pay for performance participation

Cost Benefits

- Less data for inpatient than outpatient
- EHR in a community hospital (Zlabek 2010)
  - 18% reduction in lab tests performed
  - 7% reduction in imaging performed
  - 75% reduction in transcription costs
  - 26% reduction in paper use
  - 14% decrease in medication errors

Cost Benefits

- EHR Implementation need not necessarily break the bank

- Virginia Mason Medical Center (Schmitt, 2002)
  - 280 bed hospital
  - Investment in EHR of $19 Million over 7 yrs
  - Present value savings estimated to be $31 Million

Cost Savings Data for Canada

- $1.3 billion in savings from the implementation of EHRs by family physicians across Canada since 2006 to 2012. (study by Canada Health Infoway & Pricewaterhouse Coopers, 2013)
- $800 million dollars in administrative efficiencies (less time by staff pulling and filing charts or processing finding lab test results, less time by doctors reading and maintaining paper files)
- $584 million dollars in health system benefits (reduced duplicate diagnostic testing, reduced adverse drug events)
- The study also found that EMR adoption contributed to improved chronic disease management and illness prevention (ie. Improved screening and vaccination rates)

Take Home Message from studies about EHR benefits

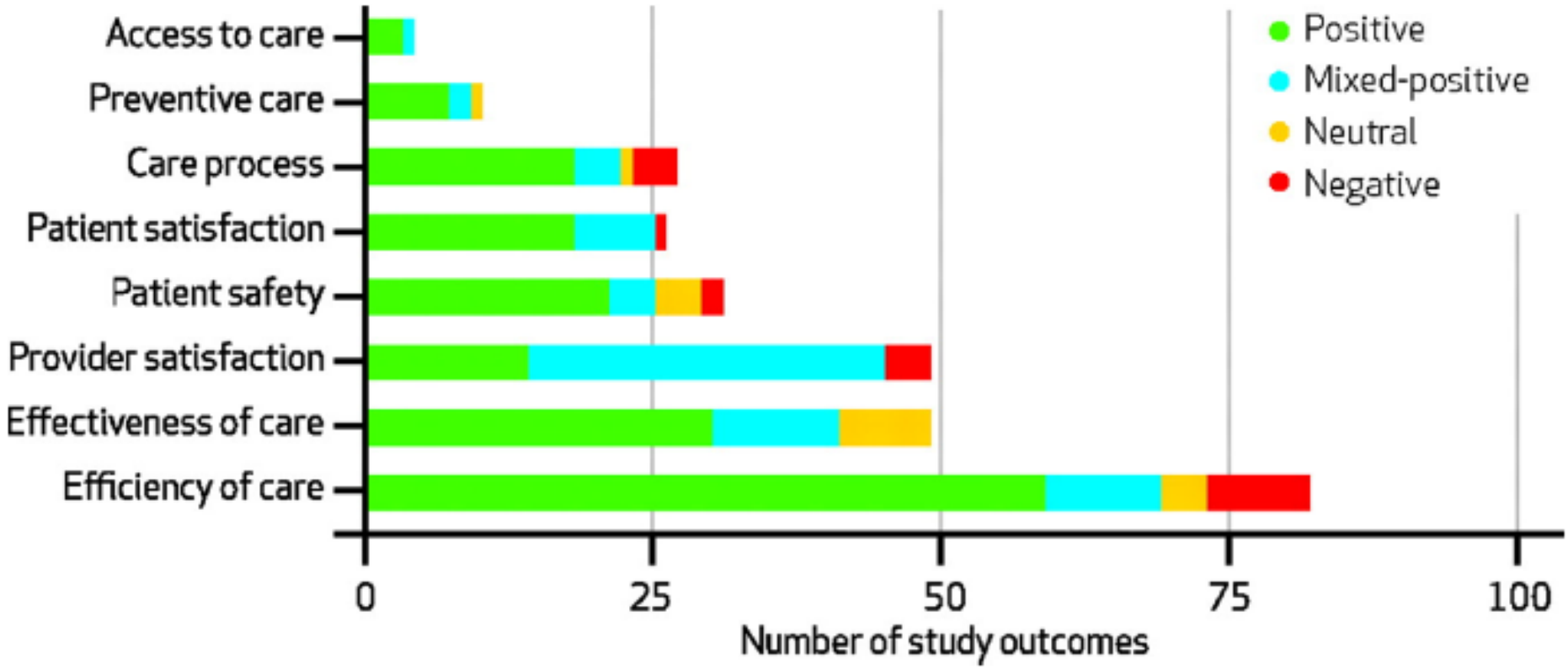
– Enhanced surveillance and monitoring

- Improved practitioner performance

– Decreased medical errors

- Long term cost savings

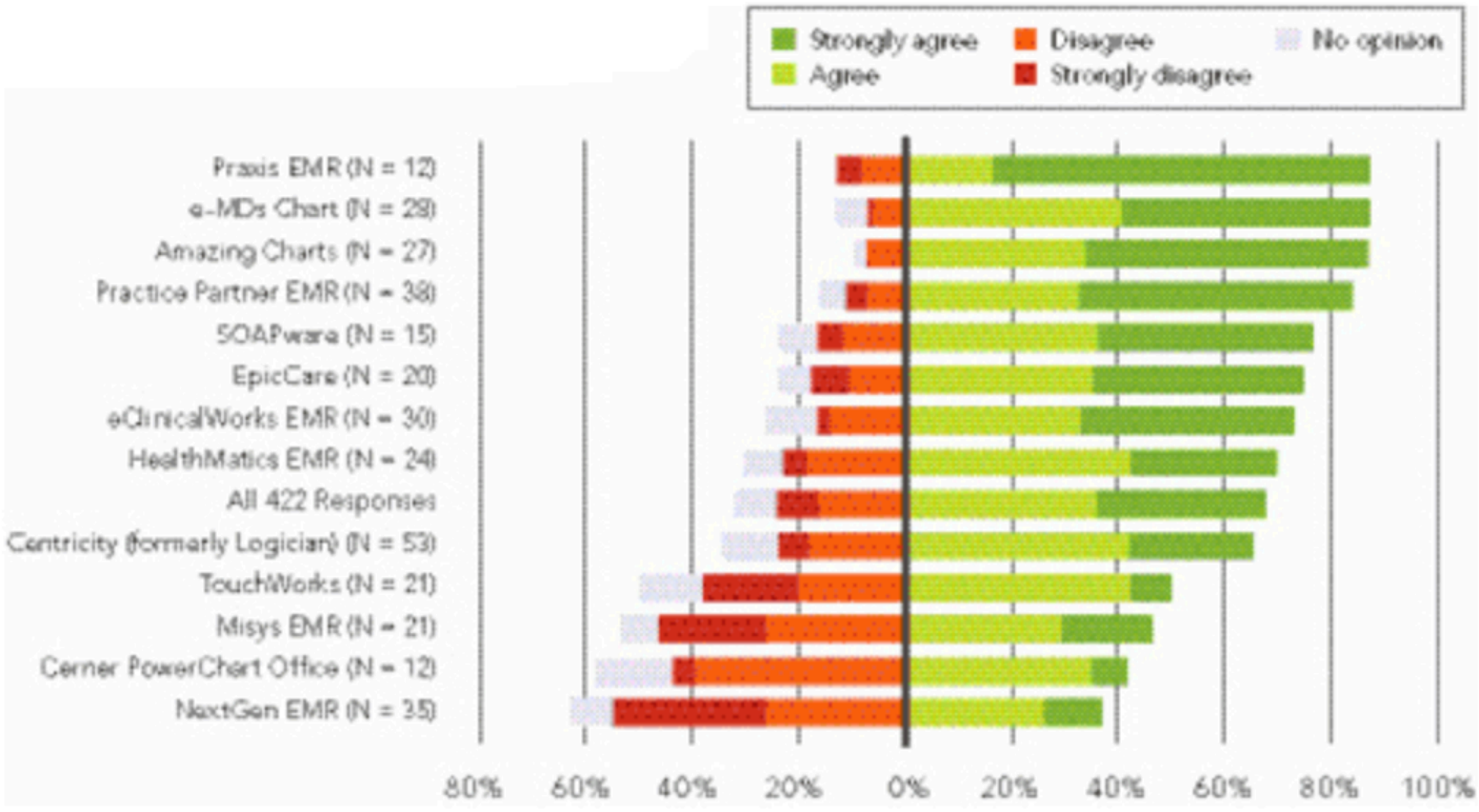
Outcomes by category (Buntin, 2011)



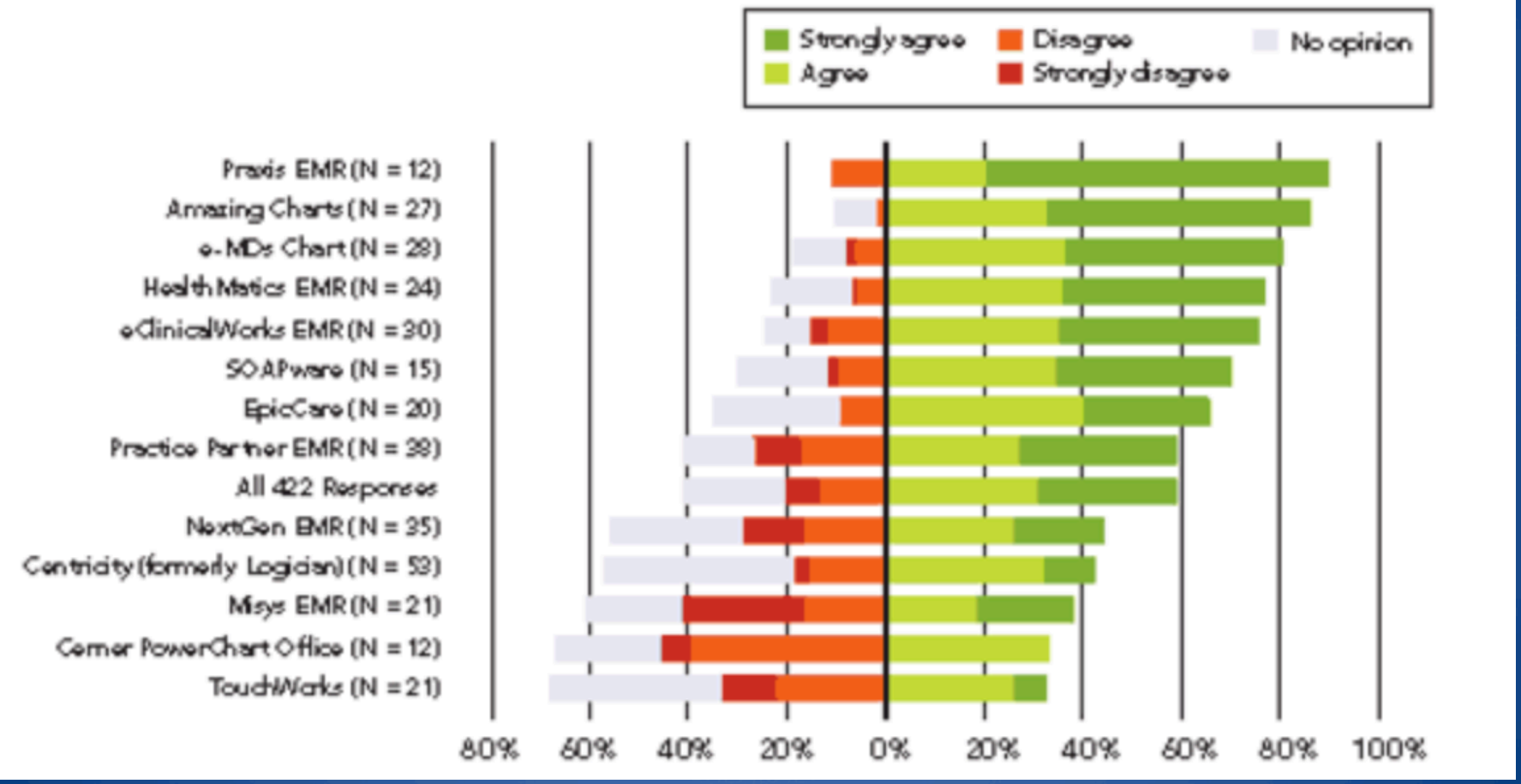
FUNCTIONALITY RANKINGS FOR 13 EHR SYSTEMS

Functions facilitated or performed by the system	e-MDs Chart (N = 28)	Praxis EMR (N = 12)	Practice Partner EMR (N = 38)	Centricity (formerly Logician) (N = 53)	EpicCare (N = 20)	HealthMatics EMR (N = 24)	eClinicalWorks EMR (N = 30)	Amazing Charts (N = 27)	SOAPware (N = 15)	NextGen EMR (N = 35)	TouchWorks (N = 21)	Cerner PowerChart Office (N = 12)	Misys EMR (N = 21)
Review chart information	4	5	3	7	2	6	8	1	9	12	11	10	13
Create visit notes	1	3	4	8	5	9	6	2	7	11	10	13	12
Create telephone messages	2	3	6	1	4	8	5	7	10	13	11	9	12
Generate and use referral forms, work excuses, etc.	9	3	5	4	1	8	10	6	2	7	12	13	11
Work without paper	1	3	9	8	5	2	6	7	4	10	12	11	13
Update and review problem lists	1	7	3	8	2	6	9	5	4	12	11	10	13
Update and review allergies	2	4	1	8	5	6	9	7	3	12	10	11	13
Update and review immunizations	1	10	6	8	3	9	2	4	11	5	12	7	13
Update and review medication lists	1	6	3	5	11	4	8	2	7	9	10	12	13
Present graphic views of vital signs	1	11	4	8	9	2	7	3	10	6	12	5	13
Enter and review test orders	2	1	7	6	4	3	8	5	10	9	11	12	13
Manage and review test results	6	1	4	3	2	7	8	10	9	11	12	5	13
Prescribe electronically	7	4	10	5	1	3	6	13	12	8	2	9	11
Create and review scanned documents	1	6	3	4	13	5	2	7	12	11	8	10	9
Manage referrals	8	1	5	3	2	9	4	6	12	7	11	13	10
Manage and provide patient education materials	4	3	5	2	1	7	9	10	8	6	12	13	11
Generate patient lists (e.g., all with diabetes)	5	3	4	2	11	7	6	1	8	9	12	13	10
Generate disease management reports	5	4	6	2	8	3	1	11	10	7	12	13	9
Assign tasks to other office personnel	4	2	7	5	9	3	1	8	12	10	6	13	11
EHR alerts you to problematic medications when relevant	1	3	4	7	5	2	6	13	12	9	10	8	11
EHR reminds you of health maintenance deficiencies during visit	4	2	1	3	7	11	6	13	9	5	10	12	8
EHR assists in coding visits and capturing charges	1	6	8	10	7	2	3	4	9	5	11	13	12

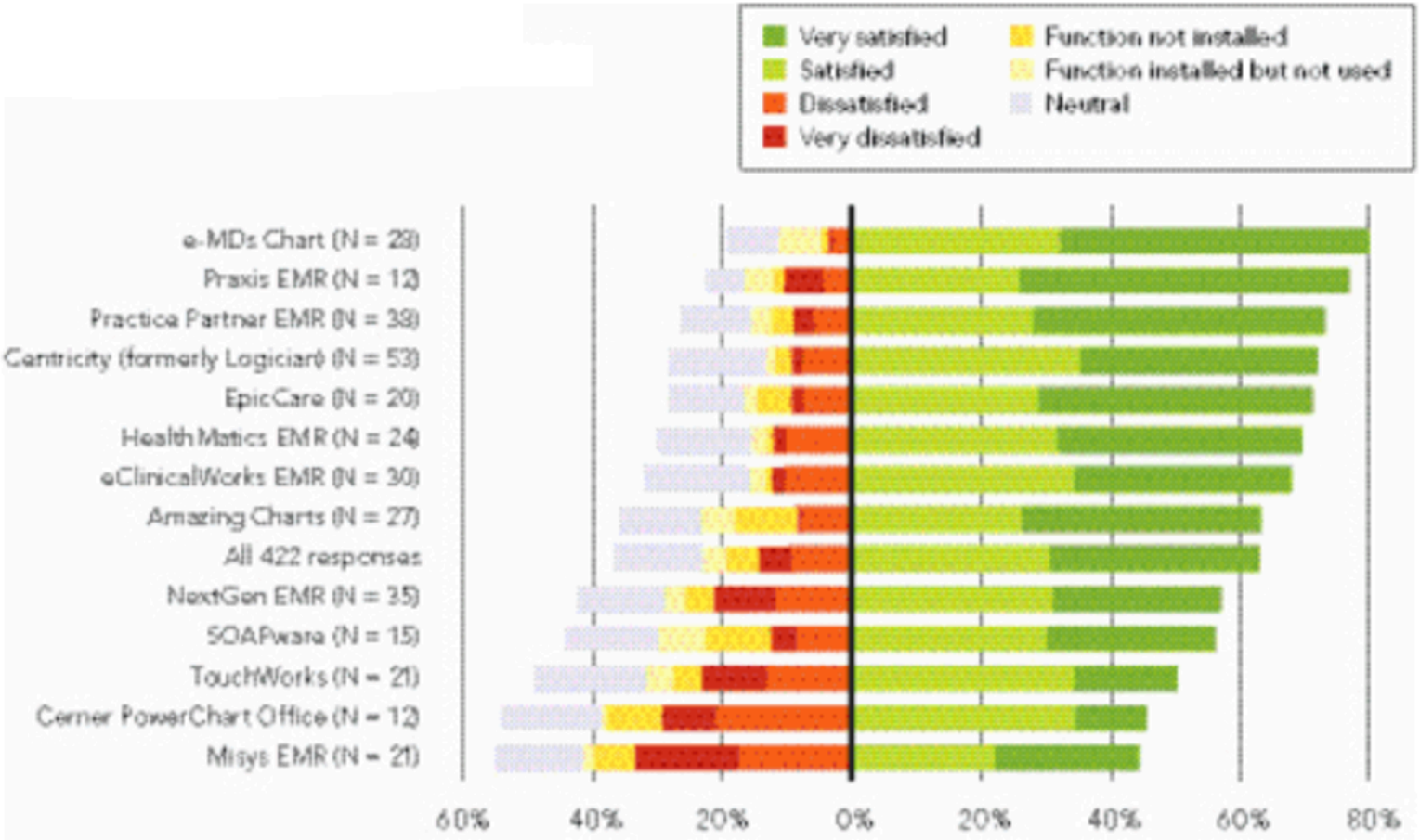
OVERALL SATISFACTION WITH EASE OF USE AND FLEXIBILITY OF 13 EHR SYSTEMS



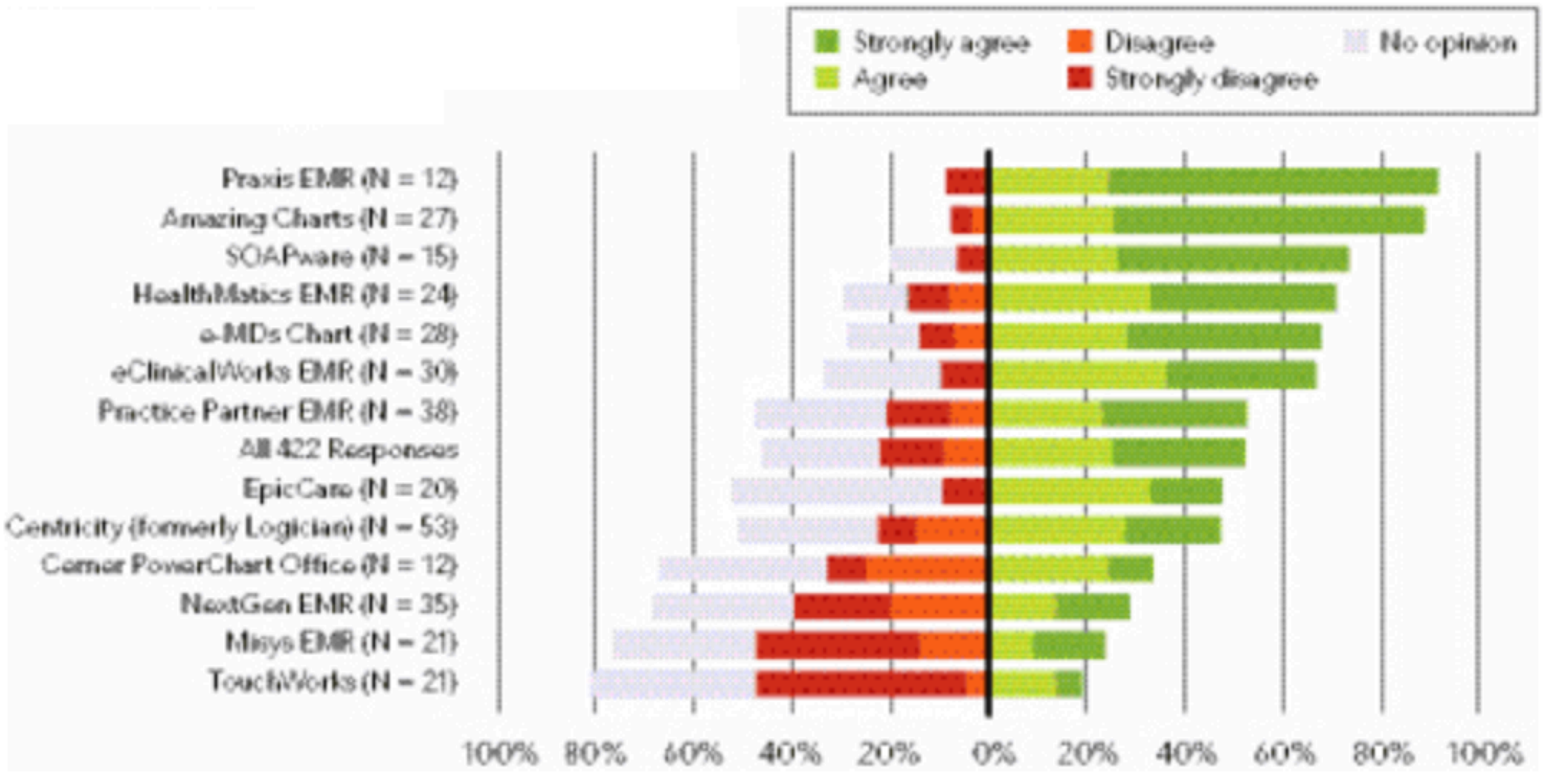
OVERALL SATISFACTION WITH SUPPORT AND TRAINING FOR 13 EHR SYSTEMS



OVERALL SATISFACTION WITH FUNCTIONALITY OF 13 EHR SYSTEMS



AGREEMENT WITH THE STATEMENT, "THIS EHR HAS SAVED OR WILL SAVE MY PRACTICE MONEY OVER ITS FIRST FIVE YEARS OF USE" FOR 13 EHR SYSTEMS



MEASURES OF OVERALL SATISFACTION: RANKINGS OF 13 EHR SYSTEMS

MEASURES OF OVERALL SATISFACTION: RANKINGS OF 13 EHR SYSTEMS

	Inclined to pick the same system again	Disinclined to go back to paper records	Disagree that the EHR system costs more than it is worth
Praxis EMR (N = 12)	83%	100%	92%
Amazing Charts (N = 27)	89%	85%	81%
eClinicalWorks EMR (N = 30)	80%	90%	83%
Practice Partner EMR (N = 38)	71%	89%	74%
e-MDs Chart (N = 28)	82%	86%	61%
EpicCare (N = 20)	81%	90%	52%
HealthMatics EMR (N = 24)	63%	92%	67%
SOAPware (N = 15)	67%	73%	80%
Centricity (formerly Logician) (N = 53)	62%	89%	42%
NextGen EMR (N = 35)	37%	69%	34%
Misys EMR (N = 21)	38%	71%	24%
TouchWorks (N = 21)	33%	57%	33%
Cerner PowerChart Office (N = 12)	8%	67%	42%

Practitioner satisfaction

- Data shows overall lowest level of satisfaction with Cerner, and highest practitioner satisfaction found with Praxis, KP HealthConnect (Kaiser Permanente), as well as VistA. (Grabenbauer, 2011)

- 2 of the most popular EHRs in USA are in fact VistA(public) & KP HealthConnect (private HMO).

Kaiser Permanente EHR

- All 36 hospitals and 431 medical offices equipped with KP HealthConnect for 8.6 million members across US

- **"More than just EHR adoption, it's been a total transformation of care delivery". (Liang, 2010)**
  - Provides paperless documentation, clinical decision support, PHR for patients, inter-health professional communication system, e-order entry, e-Rx, patient portal scheduler, etc.
  - System particularly recognized for its strength in analytics

Veterans Health Affairs (VHA, or VA)

In many ways, the VA system would be the most similar of the American centers to the Canadian healthcare system.

<u>Keys to their success:</u>

- Agreement with Federal government where money saved through cuts would stay within the VA (instead of being returned to Treasury)

- Decentralization – created more accountability by putting managers closer to those they managed

- EHR implementation

- Measure/study outcomes through EHR and make further systematic improvements accordingly

Veterans Affairs

Interesting Stats - Post EHR Implementation:

- Mortality rates for major surgeries fell by 9%, with morbidity decreasing by 30%
- Improved vaccination rates has resulted in estimated 6000 lives saved and $40 million in cost reduction
- VA has virtually eliminated dispensing errors
- 75% decrease in errors involving the wrong medication, 62% decrease in errors involving wrong dosage, 93% reduction in wrong patients receiving medicine, and 70% decrease in nurses forgetting to give medication.

Veterans Affairs

- Up until the 1990s, the VA was generally recognized as a deathtrap of a healthcare center.
- Today, the VA has better outcomes than most other healthcare centers post-EHR implementation, and leads the USA nation-wide in most outcome and quality of care measures.
- **And maybe best of all, VA pays no royalties for the use of VistA. The total cost broken down per patient is a meager 80$!!!**
- **Book of interest - Best Care Anywhere by Phillip Longman**
- **VHA blueprint should be mandatory reading – Vision for Change by Kizer**

Veterans Affairs

- VistA is considered by experts as “one of the best and most successful e-health systems in the world” (Dr. Ian Reinecke, e-health tzar of Australia)

- Of note, VistA has been adopted broadly by public health systems at the international level, examples including:
  - Australia
  - Finland
  - Denmark
  - Germany
  - India
  - Mexico
  - Brazil
  - Nigeria
  - Egypt

- Largest provider of EHR services in USA
- Its products include Powerchart
  - Currently used by VIHA in BC in limited capacity

Revenue	▲ US$ 2.665 billion (2012)[1]
Operating income	▲ US$ 571.6 million (2012)[1]
Net income	▲ US$ 397.2 million (2012)[1]
Total assets	▲ US$ 3.704 billion (2012)[1]
Total equity	▲ US$ 2.883 billion (2012)[1]
Employees	11,900 (End of 2012)[1]

Cerner

- Major issues:
  - Costs
  - Server Outages
  - Substandard communication with vendor
  - Poor user interface & design
  - Major issues with electronic order entry based on user interface (various documented reports of increased medication errors within centers post-Cerner implementation)

Talking Points

- The healthcare system is the 3rd biggest cause of mortality (in both America and Canada). In USA, 98 000 deaths per year estimated as a result of medical errors (some data shows this may be an underestimated figure, as hospital-acquired infections alone estimated to account for 90 000 deaths per year)
- Hospitals continue to routinely endanger their patients by clinging to 19th century technology.
- The question is, why?
- In America, some have argued that "bad quality is good for business. And the surest road to bad quality is bad or no information". (Kleinke, medical economist)

Take Home Points regarding the EHR

- Evidence shows overall benefit in improved efficiency, quality of care, & outcomes.
- Evidence shows cost savings in the long term, and despite high initial investment, ROI in most cases within ~2 years
- Not all EHRs are created equal. Wide range in quality and cost associated with various EHRs.
- Once committed to EHR vendor, it is often a relationship that is 'til death do us part.
- Our biggest advantage here in Canada is that we can learn from others' mistakes.

Who said this and when?

"I am fain to sum up with an urgent appeal for adopting … some uniform system of publishing the statistical records of hospitals. There is a growing conviction that in all hospitals, even in those which are best conducted, there is a great and unnecessary waste of life … In attempting to arrive at the truth, I have applied everywhere for information, but in scarcely an instance have I been able to obtain hospital records fit for any purposes of comparison … If wisely used, these improved statistics would tell us more of the relative value of particular operations and modes of treatment than we have means of ascertaining at present."

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- Florence Nightingale, 1863

Questions/Comments?