

Chances and Risks of Electronic health records

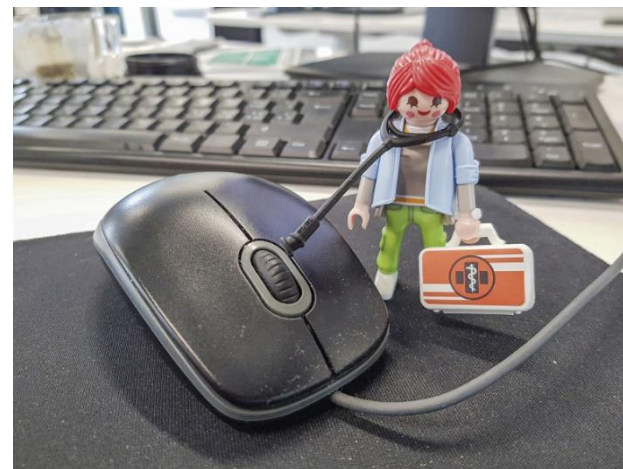
Prof. Dr. David Schwappach, MPH

Institute of Social and Preventive Medicine (ISPM)
University of Bern

David.Schwappach@ispm.unibe.ch

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Chances

- Digitization as a „promise“ for improved patient safety
- Electronic ordering systems can decrease medication errors significantly, but in general, the evidence is rather mixed
- Health IT increasingly mentioned as error-contributing factor in incident reporting systems
- Chances:
 - Barriers for high-risk orders (e.g., daily MTX)
 - Order Sets (combinations of single items in order sets)
 - Automatic stopp-Orders (e.g., for catheters or sedatives)
 - Test-result-management (e.g., automatic detection of unprocessed results)

Motivation and research questions

- Swiss physicians rather unsatisfied with electronic health records
- No empiric data on efficiency and safety performance of electronic health record (EHR) systems
- Research perspective: Ordering systems as working instrument: → impact on safety?

- How efficient and safe are Swiss EHR systems?
- Are there differences between and within different EHR systems?
- Are safety and efficiency of EHRs correlated?

Study design

- Comparison of two widely used EHR systems in Switzerland
- Investigated in 4 hospitals (2 x 2)
- Physician sample according to quota plan (function, age, sex)
- 100 physicians (4 x 25) completed routine tasks on typical patient cases (6 scenarios) under controlled conditions, e.g.,
 - Medication
 - Diagnostic Imaging
 - Blood tests
 - Nursing care, prescriptions

Study design

Scenario 3: Chest pain

Please open the case of Mr. Antonio Da Silva, born 3 February 1961, or case number XX.

Introduction

59-year-old Mr. Da Silva was complaining of chest pain radiating to his left arm, accompanied by dyspnoea. The pain feels similar to his last heart attack. The initial ECG shows normal sinus rhythm with nonspecific ST wave abnormalities.

Initial measures

Order the following laboratory tests:

- Blood count
- Chemistry: Na, K, creatinine
- Troponin

Order immediately!

In addition, order the following:

- Chest X-ray in 2 levels
Question: Pneumothorax?
- Single dose of acetylsalicylic acid (Aspegic®) 250mg IV.

Order now!

Further measures and procedures

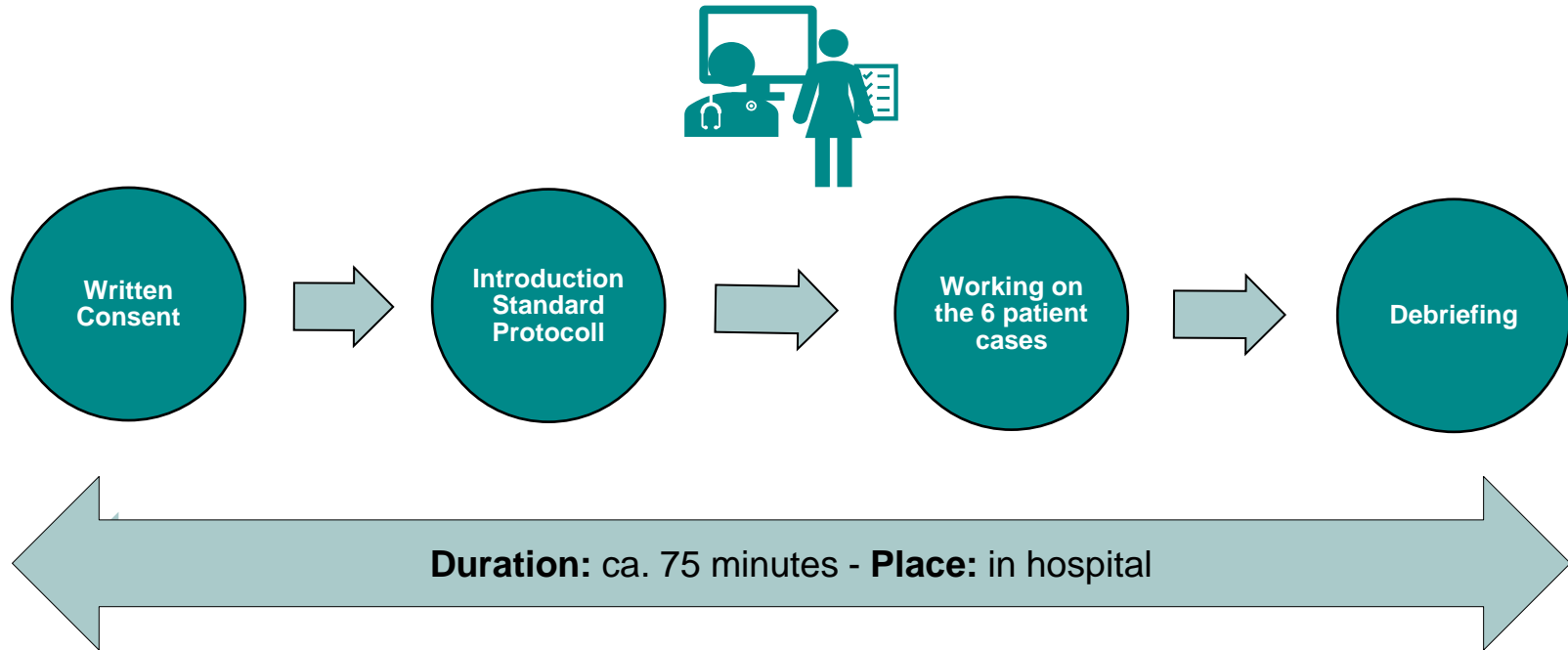
A nurse informs you that the patient's saturation has dropped to 90%. In addition, you have received the laboratory results indicating that troponin is slightly increased.

Order the following:

- Oxygen 2L / min
- Heparin bolus of 5000 IU as IV injection, thereafter continuously 30,000 IU / day
- Troponin test to be repeated in 3 hours

Order now!

Study design



Study design

- All actions captured and recorded on video (Screen- and Mousecam)
- Outcome measures:
 - Time on Task (video)
 - Mouse Clicks (video)
 - Errors (patient records)



Results

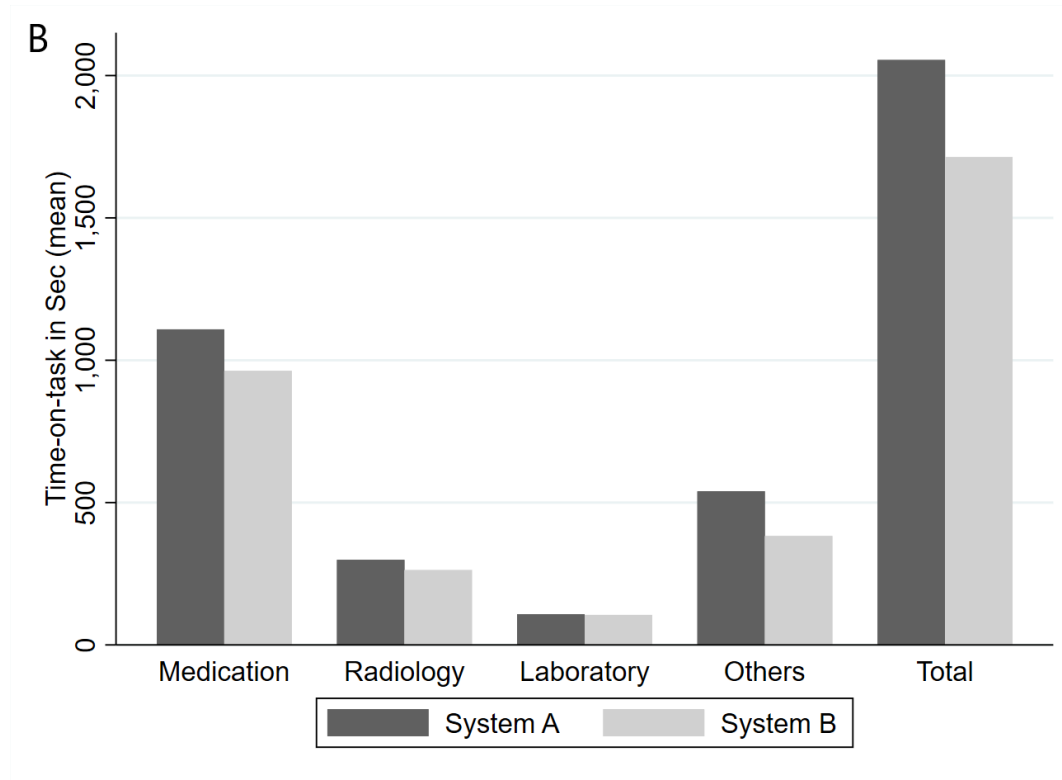
- Considerable differences between and within EHR systems

Mean	Hospital 1A n=25	Hospital 2A n=26	Hospital 3B n=24	Hospital 4B n=25
Mouse clicks (n)	459	561	456	429
Time-on-task (Sek)	1737	2361	1771	1659
Error rate	36%	43%	28%	26%
	System A		System B	
Mouse clicks (n)	511		442	
Time-on-task (Sek)	2055		1713	
Error rate	40%		27%	

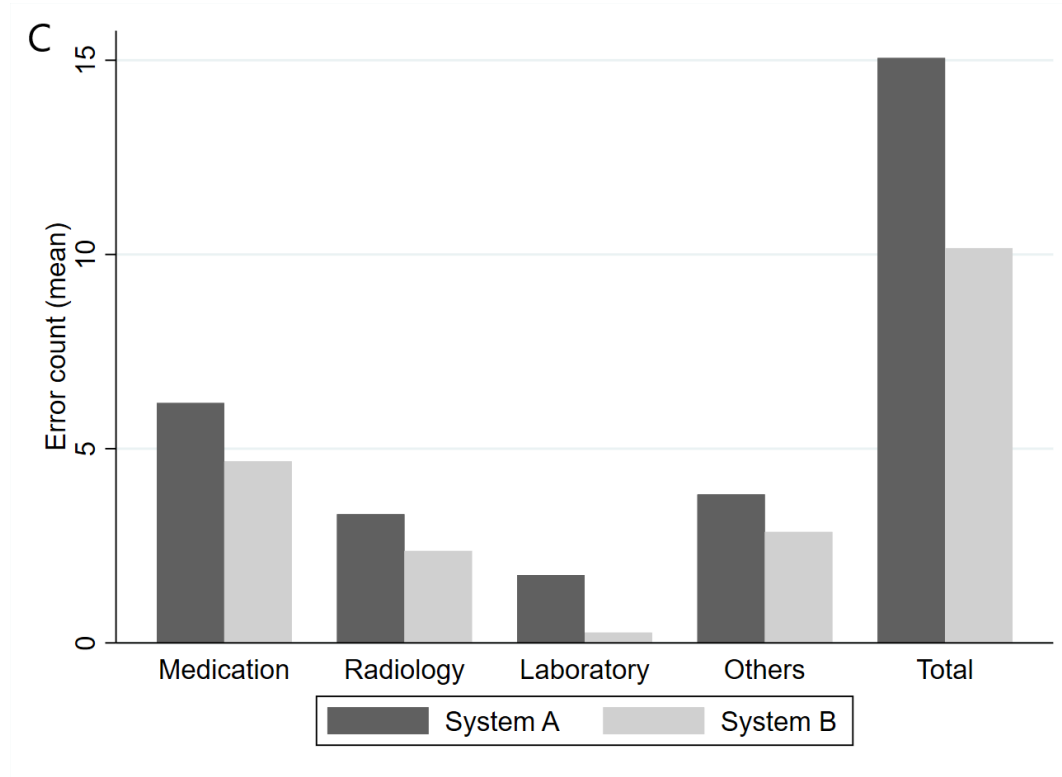
Results

- None of the participating physicians completed all tasks without error
 - Min: 1 Error
 - Max: 32 Error
 - Median: 11 Error
- Higher error rates correlated with
 - Higher number of mouse clicks ($r=0.47$, $p<0.001$)
 - Longer time-on-task ($r=0.50$, $p<0.001$)

Results



Results



Results

⇒ Please order:

Ciproxin 500mg every 12 hours for 2 additional days

Nr errors	System A n=46	System B n=49	Total n=95
0	31 (67%)	15 (31%)	46 (48%)
1	6 (13%)	27 (55%)	33 (35%)
2+	9 (20%)	7 (14%)	16 (17%)
p<0.001			





Results

⇒ Please order for the next day:

Prednison or Prednisolon (Spiricort®) 60mg tapering; reducing by 10mg every two days for 12 days in total

Mean	Hospital 1A n=25	Hospital 2A n=26	Hospital 3B n=24	Hospital 4B n=25
Mouse clicks (n)	102	87	72	78
Time-on-task (Sek)	391	354	267	301
Error rate	142%	178%	114%	133%
Most frequent errors	Wrong dose and wrong start- or stop date			

Results

	Task type	Error type	
	Medication (544 errors)	Wrong dose	29%
		Wrong start and/or stop date	28%
		Wrong interval	22%
	Radiology (285 errors)	Wrong level	50%
		Contrast agent not ordered	16%
		Wrong localization	14%
	Tests (93 errors)	Wrong time	88%
		Additional parameters / duplications	7%
		Incomplete order	5%
	Other (338 errors)	Incomplete order	37%
		Wrong intervall (prescription)	22%

Conclusion

- Considerable differences between EHR systems but also between local implementations of the same system
- High error rates produce high levels of „noise“ in the care system
- Results underestimate reality (e.g., no interruptions)
- Efficiency and safety indicators are correlated → economic argument
- EHR systems can and need to improve!

Outlook

- **Aim: To realize the potential for patient safety**
- Poor Usability associated with burn-out
- Currently, there is little transparent information about safety performance of different systems available for users
- We need quantitative data, not just subjective perceptions of safety
- Development, testing and establishment of test procedures to evaluate the safety performance of EHR and ordering systems
 - Functionality of barriers for wrong high-risk orders
 - Standardized usability tests
 - Prevalence of workarounds by clinicians (e.g., medication in free-text orders)

Thank you for your attention

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