

The Social Act of Electronic Medication Prescribing

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Abstract. Prescribing medication is embedded in social norms and cultures. In modern Western health care professionals and policy makers have attempted to rationalize medicine by addressing cost-effectiveness of diagnostic and therapeutic treatments and the development of guidelines and protocols based on the outcomes of clinical studies. These notions of cost-effectiveness and evidence-based medicine have also been embedded in technology such as electronic prescribing systems. Such constraining systems may clash with the reality of clinical practice, where formal boundaries of responsibility and authorization are often blurred. Such systems may therefore even impede patient care. Medication is seen as the essence of medical practice. Prescribing is a social act. In a hospital medications may be aimed at treating a patient for a specific condition, in primary care the professional often meets the patient with her or his social and cultural notions of a health problem. The author argues that the design and implementation of electronic prescribing systems should address the social and cultural context of prescribing. Especially in primary care, where health problems are often ill defined and evidence-based medicine guidelines do not always work as intended, studies need to take into account the sociotechnical character of electronic prescribing systems..

Keywords. Electronic prescribing; Medication; Medicine

1. Prescribing Medicines

Prescribing medicine is a social act [1]. Through prescriptions physicians show their patients that they recognize their complaints and are trying to help them. Where medication is seen as the essence of medical practice, prescribing is the main thing expected from a physician. A non-prescribing physician is seen as a contradiction. Prescribing medications represents two sides of the same coin. On the one hand it shows the authority of the physician by being able to solve a problem of the patient, on the other hand the patient demands an instantaneous solution of his complaint. Prescribing a medicine comes to the rescue of offering an immediate therapy, even its efficacy is doubtful. A prescription functions as a legitimation of the patient's sickness. In some cultures a patient never goes home without a prescription, in other both physicians and patients feel restraints [2]. It may explain why medication consumption varies wildly in different Western countries. However, the overall consumption of medications has grown exponentially and has become an important cost factor of health care [3]. Health authorities and administrators have sought to contain the cost growth

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and one attempt was to make physicians aware of the notion of rational prescribing. Not only would doctors prescribe drugs that really would work for a disease, but also they would be encouraged to look at what costs the effect was achieved and whether prescriptions could be filled with cheaper medicines. A similar role was attributed to pharmacists and they were given the right to alter prescriptions to substitute with cheaper ones. Often it would mean that generic drugs would replace brand drugs. Rational prescribing was seen as one of the outcomes of evidence based medicine. Based on the results of clinical trials and meta-studies guidelines and protocols would be established to guide physicians in making diagnoses, selecting the proper course of action and assess treatment outcomes. It would be hoped that doctors would adopt these insights and put them to use in practice. In hospitals the costs of physician prescribing would be borne by the organization. The cost increase prompted one hospital in the early 70s to design and implement an electronic prescribing system for physicians and this new class of information systems became also known as computerized physician order entry (CPOE) systems [4]. Much later focus shifted to patient safety. In his seminal paper in 1994 Lucian Leape wrote that the error rate in the practice of medicine was high and that more than half of them could be attributed to medication errors [5]. Already in the late 90s studies reported a positive effect of CPOE on the decrease of medication errors [6, 7]. The landmark Institute of Medicine studies on human errors in medicine and quality of care advocated the use of electronic prescribing systems in health care [8, 9]. The adoption however has shown to be a very slow process. Aarts and Koppel reported nine years later that in seven Western countries they studied the adoption rate was nowhere higher than 20% of the hospitals [10]. Another study reported that ten years after the publication of the IOM reports efforts to reduce errors in medicine had limited success [11]. There is clearly a gap between the expectations of professional and organizations adopting scientific evidence and technology to improve practice and reality.

2. Electronic Prescribing

Electronic prescribing is a social act. Though electronic information systems are often seen as “neutral” tools to help a job done, they represent in fact social norms embedded in technology. The original Eclipsys system allowed physicians only to pick medicines from an approved hospital formulary. The hospital administrators expected that physicians would only select from this formulary and thus help save medication costs. The hospital did indeed report savings and improved efficiency of nursing documentation [12]. But embedded norms do form a clash with reality. Another norm is the authority to prescribe, which rests with physicians. Only physicians are authorized to enter medication orders. In many hospitals it was (and perhaps still is) practice that nurses in night and weekend shifts could order pain medications to relieve their patients, because of limited availability of physicians. For that purpose nursing stations would have a pile of pre-signed prescription notes that nurses could fill out. Physicians trusted this work practice because they knew that the nurses were knowledgeable and experienced. The advent of CPOE made this way working impossible and put the burden of entering orders completely on physicians. In one instance it caused physicians to protest the increased workload [13]. In other instances, users created workarounds to make their work doable. In a study of the implementation of CPOE in a Dutch hospital Goorman and Berg found how the problem of only

physicians being responsible for medication orders was circumvented in case of emergencies by an 'agent for' device. A nurse could on behalf of a physician enter medication orders, which would be signed off later by the physician [14]. Embedded in CPOE are also guidelines and protocols in the form of decision support. Guidelines and protocols represent proper practice of medicine. A medication order may prompt the physician to look for specific patient data, and not allow completion of an order unless he had acknowledged at least of having seen them. In a number of specialties it might be seen as an annoyance, delaying precious time in patient care, because using specific pieces of patient information might be routine. This is also the case in situations where physicians may receive reminders about drug interactions, when they intend to prescribe additional drugs. Reminders can prevent medication errors, but if appropriate reminders are drowning in a sea of less useful reminders, then the positive effect can be mitigated. The number of ignored reminders runs up to over 90% [15]. Similarly it has been proven very difficult to reduce the number of inappropriate reminders. In the first place doctors among themselves do not agree on which can be turned off [16]. They report that they themselves might know what to do, but that doctors from other specialties or residents would surely need them. In the second place, the technology is still far from perfect. Using medication cases as gold standard, van der Sijs and her colleagues found that CPOE systems would respond differently requiring additional pharmacy review [17]. Implementing CPOE can have unintended consequences as well. During rounding, medication orders are verbally communicated by physicians and sometimes corrected by nurses, who would know about the exact health status of a patient. It was an effective way for nurses to know when administering drugs should be started and a perfect safety net to prevent errors. A CPOE system forces a doctor to look for a computer, often sitting in a separate office, and the doctor would lack interaction with colleagues when entering the order. Koppel and his colleagues identified a number of situations that CPOE would potentially induce new errors [18]. It is clear that electronic prescribing systems are being designed and implemented with embedded intent and purpose. Often, they rather shift workarounds instead of removing them completely. Lacking the interaction with colleagues when entering an order, new workarounds may arise to compensate it, like writing down the order on a piece of paper during rounding and delay entering orders until after rounding. Because of this intertwinement with organizational context and culture, they are in essence sociotechnical systems [19].

3. The Future

In September 2010 the director-general of the Dutch health inspectorate announced that electronic prescribing would become mandatory on January 1, 2012. Most likely, it will be less of a problem in hospitals. Most hospitals in the Netherlands are currently implementing electronic prescribing technologies. The shortage of physicians have led to the introduction of nurse practitioners and physician assistants, who have received prescribing authority, supervised by physicians. In a way the problem of the informal work practice of nurses filling out orders has been removed by reconsidering prescribing authority [20]. Clinical wards are in a way a kind of a micro-cosmos, where professionals influence each other's behaviors. The wide-scale implementation of electronic prescribing will be much more difficult in primary care. More often, patients visit a primary care doctor with vague complaints. In such situations emphasis on

evidence-based medicine in the form of guidelines and protocols is problematic and physicians prescribe medications as a magic wand to address the needs of their patients. A point in case is antibiotics, one of the most successful drugs in medicine. Indiscriminate use to combat infections has caused the emergence of resistant organisms compromising their efficacy. Prescribing antibiotics is nowadays based on practice guidelines and carefully monitored because of increased insensitivity to infectious microorganisms. Yet, even in hospitals non-medical reasons still influence antibiotics prescribing [21]. One need not to be farsighted to see that the problem is much larger in primary care practice, where a physician sees such a diverse patient population of different social and cultural backgrounds. A study of prescribing antibiotics for sore throats in primary care reported that physicians were well aware of the marginal effects but yet often prescribed for good relationships with patients [22]. Most studies of electronic prescribing have been done in a hospital context. Primary care is still largely uncharted territory. Future studies are needed to understand the sociotechnical and cultural character of primary care prescribing using electronic prescribing systems. In a recent paper I described a number of conditions that need to be addressed [23]. They include interoperability allowing electronic prescribing systems to interact with other systems so that patient medication information is more readily available, improving decision support technology, and focus on the continuity of care, in which professionals, organizations and systems are better aligned. But foremost future research needs to focus on the question how the practice and social nature of health care, evidence-based medicine and technology could be better integrated. Bosk et al report in a commentary that giving a 'simple checklist' to professionals as a solution to improve patient safety is based on the mistaken assumption that a technical solution can solve a sociocultural problem [24]. Obliging exchange of patient medication information between primary, secondary and tertiary care is makes sense, but I am not in favor of mandating electronic prescribing so soon. There are a lot of issues in the practice of health care that need to be resolved before it can become meaningful.

References

- [1] van der Geest S, Whyte SR, Hardon A. The anthropology of pharmaceuticals: a biographical approach. *Annu Rev Anthropol.* 1996;25:153-78.
- [2] Payer L. *Medicine & culture: varieties of treatment in the United States, England, West Germany, and France.* 1st ed. New York: Henry Holt; 1988.
- [3] Lied TR, Gonzalez J, Taparanskas W, Shukla T. Trends and current drug utilization patterns of Medicaid beneficiaries. *Health Care Financ Rev.* 2006 Spring;27(3):123-32.
- [4] Hodge MH. History of the TDS medical information system. In: Blum BI, Duncan K, editors. *A history of medical informatics.* Reading (MA): Addison-Wesley Publishing Company; 1990. p. 328-44.
- [5] Leape LL. Error in medicine. *JAMA.* 1994 Dec 21;272(23):1851-7.
- [6] Overhage JM, Tierney WM, Zhou XH, McDonald CJ. A randomized trial of "corollary orders" to prevent errors of omission. *J Am Med Inform Assoc.* 1997 Sep-Oct;4(5):364-75.
- [7] Bates DW, Leape LL, Cullen DJ, Laird N, Petersen LA, Teich JM, et al. Effect of computerized physician order entry and a team intervention on prevention of serious medication errors. *JAMA.* 1998 Oct 21;280(15):1311-6.
- [8] Kohn LT, Corrigan JM, Donaldson MS, editors. *To err is human, building a safer health system.* Washington, D.C.: National Academy Press; 2000.
- [9] Committee on Quality of Health Care in America. *Crossing the quality chasm, a new health system for the 21st century.* Washington, D.C.: National Academy Press; 2001.
- [10] Aarts J, Koppel R. Implementation of computerized physician order entry in seven countries. *Health Aff (Millwood).* 2009 Mar-Apr;28(2):404-14.

- [11] Landrigan CP, Parry GJ, Bones CB, Hackbarth AD, Goldmann DA, Sharek PJ. Temporal trends in rates of patient harm resulting from medical care. *N Engl J Med*. 2010 Nov 25;363(22):2124-34.
- [12] Watson RJ. A large-scale professionally oriented medical information system - five years later. *J Med Syst*. 1977;1(1):3-21.
- [13] Massaro TA. Introducing physician order entry at a major academic medical center: I. Impact on organizational culture and behavior. *Acad Med*. 1993 Jan;68(1):20-5.
- [14] Goorman E, Berg M. Modelling nursing activities: electronic patient records and their discontents. *Nurs Inq*. 2000 Mar;7(1):3-9.
- [15] van der Sijs H, Aarts J, Vulto A, Berg M. Overriding of drug safety alerts in computerized physician order entry. *J Am Med Inform Assoc*. 2006 Mar-Apr;13(2):138-47.
- [16] van der Sijs H, Aarts J, van Gelder T, Berg M, Vulto A. Turning off frequently overridden drug alerts: limited opportunities for doing it safely. *J Am Med Inform Assoc*. 2008 Jul-Aug;15(4):439-48.
- [17] van der Sijs H, Bouamar R, van Gelder T, Aarts J, Berg M, Vulto A. Functionality test for drug safety alerting in computerized physician order entry systems. *Int J Med Inform*. 2010 Apr;79(4):243-51.
- [18] Koppel R, Metlay JP, Cohen A, Abaluck B, Localio AR, Kimmel SE, et al. Role of computerized physician order entry systems in facilitating medication errors. *JAMA*. 2005 Mar 9;293(10):1197-203.
- [19] Berg M, Aarts J, Van Der Lei J. ICT in health care: sociotechnical approaches. *Methods Inf Med*. 2003;42(4):297-301.
- [20] Kroezen M, van Dijk L, Groenewegen PP, Francke AL. Nurse prescribing of medicines in Western European and Anglo-Saxon countries: a systematic review of the literature. *BMC Health Serv Res*. 2011;11:127.
- [21] Hulscher ME, Grol RP, van der Meer JW. Antibiotic prescribing in hospitals: a social and behavioural scientific approach. *Lancet Infect Dis*. 2010 Mar;10(3):167-75.
- [22] Butler CC, Rollnick S, Pill R, Maggs-Rapport F, Stott N. Understanding the culture of prescribing: qualitative study of general practitioners' and patients' perceptions of antibiotics for sore throats. *BMJ*. 1998 Sep 5;317(7159):637-42.
- [23] Aarts J. The future of electronic prescribing. *Stud Health Technol Inform*. 2011;166:13-7.
- [24] Bosk CL, Dixon-Woods M, Goeschel CA, Pronovost PJ. Reality check for checklists. *Lancet*. 2009 Aug 8;374(9688):444-5.