“Software must not manipulate the physicians:” The IT Challenge to Patient Care

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Abstract:

Information technology plays an increasingly important role in the medical working environment. Besides facilitating improvements in the quality of health care, it might also bear some unwished effects. Examining the 'making' of a diagnosis and the role it plays in modern medicine leads to the question how far this process of 'diagnosing' might be affected by the 'technical surroundings'. A number of examples from clinical medicine in the hospital and the ambulatory sector illustrate the way IT is being utilised in modern medicine. A twofold negative effect could result from this 'computerisation': Firstly, the technical requirements for the use of IT might force the process of diagnosing to be adapted with subsequent wrong or altered diagnoses. Secondly, constraints like cost control might be facilitated by IT and thus its application might cause the doctors trying to avoid such pressures by modifying the diagnosis and potentially worsening treatment and outcome.

Agenda

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"Programme dürfen Ärzte nicht manipulieren" (Software must not manipulate the physicians) reads a recent headline of an article in the German medical journal[1], discussing the effects of drug advertisements by sponsoring drug companies hidden in software designed for the administration of GP-practises.

The use of modern IT equipment is changing the working environment at medical practices and in hospitals alike. From patient administration to the documentation of the clinical course of events, from delivering and storing the results of special examinations to writing discharge letters and the billing of the care, the health care professional nowadays is facing computers everywhere.

Has this 'computerisation' of the medical workplace negative consequences for the quality of medical care? Does it affect the health carer-patient relationship? To answer these questions, the 'function' of a diagnosis needs to be understood and the influence that IT might have on the making of diagnoses and on the choice of treatment to be analysed.

'Making' of a diagnosis

"How is the appendicitis in room 12 doing?" - A patient's diagnosis is one of the key concepts in modern medicine and medical practitioners have been criticised for a tendency to treat diagnoses rather than patients. But despite of its central role, even in times of 'evidence based medicine' the 'making of a diagnosis' is a rather weakly defined process. A sequential approach is being taught at medical schools and usually, is followed by the medical practitioner (i.e. general history, history of complaints, physical examination, specific 'diagnostic' procedures)[2]. Yet 'diagnosing' lacks clear epistemological rules as they might be expected in science. The diagnosis rather acts as a working hypothesis for the further care of the patient, based on an initial assumption that is generated by using a combination of the patient's complaints, clinical symptoms and the doctor's experience. Thus a diagnosis is not a definite and ultimate entity but rather 'the best guess under what is currently known', and such a diagnosis is continuously reassessed and modified by additional data gained either from further investigations or from the clinical course and the response to specific therapy[3]. Therefore a diagnosis contains the influence of interpretation by the medical professional and is determined positively (by supporting findings) and negatively (by the exclusion of other diagnoses through contradictory findings), in extreme, a diagnosis can be made entirely by exclusion.

The role of a diagnosis

First and foremost, the classical function of the diagnosis is to predict the natural course and (if necessary) to choose an adequate therapy for the patient's condition[4]. Adequate in this case means a therapy that is likely to succeed. In times of 'evidence based medicine' (EBM) this necessitates proof of effectiveness and efficiency in random controlled trials, but the choice of the right therapy as well involves the physician's experience (e.g. "Is the patient likely to adhere to such a therapy?").

In a broader sense, 'adequate therapy' can imply the inclusion into comprehensive treatment programs, e.g. the 'disease management programs' (DMP) offered by health insurances[5] or treatment programs run by governmental institutions[6].

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[1] Rabbata, Samir: Praxissoftware: Programme dürfen Ärzte nicht manipulieren. 1346

[2] rooting in traditions as old as the Hippocratic era, the introduction of the 'Clinical Method' has been reported for the end of the 19th century: McWhinney, Ian: A Textbook of Family Medicine. 130-4

[3] some of these epistemological features the 'diagnosis' shares with 'scientific theories' in the way Karl Popper defines it, cf. K.P.: Alles Leben ist Problemlösen. 26ff

[4] McWhinney, Ian: A Textbook of Family Medicine.152

[5] as one example the diagnosis of Diabetes mellitus Type II ‚qualifies' a patient for the inclusion into the respective 'disease management program' of the Bismarckean health insurances in Germany

[6] following WHO recommendation, the tuberculosis treatment in many countries is offered free of charge, and in South Africa a confirmed positive HIV test allows the patient access to the 'wellness program', including prophylaxis and treatment of opportunistic infections, regular blood investigations and the provision of antiretroviral medication according to the stage of the disease

In a similar way, the diagnosis can justify social benefits as well, e.g. if the patient qualifies for social grants[7], sick-leave or even just attention and support by others.

On the other hand, diagnoses can exclude the affected person from intended activities such as practising a certain profession (e.g. becoming a pilot) or even from social 'privileges' such as immigration[8] or the granting of a life insurance policy.

In extreme cases, a diagnosis even can cause specific medical treatment not to be given to the patient, such as dialysis (if infectious diseases such as Hepatitis or HIV are present) or transplantation (if a malignant disease is diminishing the potential recipient's prognosis).

In certain diseases, the diagnoses have an 'alarming effect' for the community as well. Public-health-practitioners get alerted by 'Tuberculosis', 'meningococcal meningitis' or 'Ebola' and consecutively infection control mechanisms are implemented. Clusters of occupational illnesses may lead to a thorough investigation of the underlying cause and to the introduction of better protection for the worker.

Sadly, a diagnosis can qualify a deceased person as potential organ donor ('brain-dead' but otherwise 'healthy'), thus giving new hope to others.

And last but not least, the diagnosis satisfies the doctor's curiosity and enables the doctor to communicate his observations. Whether this happens in form of the description of a single case (case report) or in a large multi-centre randomised study, the diagnosis serves as an essential tool for the medical scientist to identify what he is talking about.

The benefits of IT in medicine

IT has given rise to completely new diagnostic tools such computer tomography and has revolutionised the effectiveness of other techniques like ultrasound. In addition to this, many results of examinations are being stored digitally today (e.g. x-rays), with a number of beneficial effects like the reduced need for archives, the easier, faster and more reliable accessibility and the opportunity to process such images. In hospitals and medical centres with a dedicated IT-support, IT-networks can fasten the transfer of requests and make results that have been generated elsewhere (X-ray, ultrasound, laboratory, ECG etc.) immediately available to the doctor who ordered the investigation[9]. This is probably one of the applications of IT that is most beneficial for the patient since both, making the diagnosis and treating the suffering are accelerated.

In other situations 'telemedicine' is used to offer specialised care that would not be available otherwise, e.g. a neurosurgical opinion for patients in small hospitals without such specialists[10].

The aim to deliver better care or to achieve better efficiency and continuity of care has given birth to other kinds of networks for integrated care, too. In the British NHS clinics, hospitals and 'mobile doctors' are linked by one computer-network and findings during an out-of-hours home visit to a patient are electronically forwarded to the patient's GP[11]. A similar approach is planned in Germany with the 'elektronische Gesundheitskarte'[12], where the digitally served data in the card are intended to prevent unnecessary double investigations or accidental application of drugs when a known allergy exists[13].

An IT-application of less direct benefit for the patient is the digitalised claiming, where the provider (doctor) uses a computer and software to capture the relevant data on the patients he sees (name, insurance number, diagnosis etc.) and forwards it in an electronic format defined by the medical aid to

[7] in South Africa a social grant is given to HIV-patients solely dependent on the CD4-count (<200)

[8] e.g. when countries ask for medical certificates

[9] Krüger-Brand, Heike: Picture Archiving and Communication System – Abschied von der „Bildertüte". 1949-50

[10] e.g. within a network in the north-eastern German state of Mecklenburg-Vorpommern, connecting smaller hospital with the university hospitals

[11] though the EMIS© system used in the NHS still does not allow immediate access to e.g. specialist reports - personal experience in the UK

[12] Krüger-Brand, Heike: Orientierung am Anwender. 2001

[13] cf. on the advantages in family practice: McWhinney, Ian: A Textbook of Family Medicine. 379-80

claim the payment for the treatment[14]. Similarly hospitals use special software not only to administrate the patients but to capture the patients' diagnoses and procedures, something essential in times when electronic 'grouper' generate a 'diagnose related group' (DRG) from these data and these DRGs e.g. in Germany are defining the financial remuneration for the respective case.

In other applications as well, the computer is used to make data capturing easier and more efficient, when public health authorities or research institutions utilise these aides to collect and process large amounts of data, hoping to identify relevant threats, risk factors and the same.

Potential negative influence of IT on doctors' behaviour and on the quality of medical care

The possible adverse effects of the use of IT in medicine can be grouped into two classes, i.e. those effects that are intrinsic to the use of IT (e.g. the conversion of thoughts or verbal information into digital data) and those effects where IT 'facilitates' negative influences from other sources.

The quest for an early diagnosis

Converting a diagnosis into a computerised code first necessitates certain skills, the medical practitioner (or somebody else who forwards and processes the information) will have to be able to enter the diagnosis and supporting evidence into the computer system. The change of 'medium' this information is undergoing, restricts its range of content, the differentiated thoughts and doubts about such diagnoses in a doctor's mind or even as shared knowledge in a medical firm in the ward is reduced to a definite entity. In principle, this phenomenon is not a new one, as diagnoses had been fixed in written medical works (books, discharge letters etc.) for centuries. Yet, the difference might be that the computerised data may be easier accessible to others, without any additional comment by those who 'created' the diagnosis, and thus might be more prone to misinterpretation[15]. Due to the fact that the actual diagnosis is e.g. in Germany's DRG system relevant for the financial outcome, administration and the senior clinical staff pay a high degree of attention to an early and 'appropriate' encoding of the admission diagnosis. In this manner, a potentially 'premature' diagnosis-making is motivated for. Despite of the possibility to alter the diagnosis during (and even after[16]) the hospitalisation of the patient, an initially made wrong diagnosis has a strong potential to affect the further treatment ('being on the wrong track').

Similarly, even in the ambulatory sector in Germany and in South Africa the medical practitioners in private practise are forced to justify their payment claims for treatment and medications by (ICD-encoded) diagnoses. Since in German family medicine, the intentional delay of making the ultimate diagnosis ('abwartendes Offenlassen der Diagnose')[17] is a well accepted procedure in many minor complaints, this 'demand for a diagnosis' contravenes the recommendable approach for the case management. At least the German system offers an additional code to express whether a diagnosis is suspected (**V**erdacht), confirmed (**G**esichert) or excluded (**A**usgeschlossen) with the respective letter to be added to the ICD-code. In this way, a bit of the considerations and doubts can be mirrored in the digital system - an opportunity the system in the hospital sector, unfortunately does not allow for.

To adjust the diagnosis or the patient?

On the other hand, the process of 'digitalising' the diagnosis might influence its content by more fac-

[14] in Germany, where the ‚Kassenärztliche Vereinigung' (KV) acts as an intermediary between doctors and medical aids, the KV Hamburg in 2004 coined the expression 'Papierabrechner' ('paper-claimer') for those practitioners who still used the 'archaic' procedure without computer

[15] despite of the principle aim to achieve it, the allocation of diagnoses and ICD 10 codes (tenth revision of the international classification of diseases, a code that consists of a letter and one to five digits) is unfortunately not always one-on-one ('ein-eindeutig' – reciprocal unambiguity), thus a single ICD 10 code can represent different diseases or the same disease might be encoded using different codes

[16] e.g. in case of pending histological results

[17] in cases of minor complaints and after excluding live threatening complications, it is justified to monitor the patient since the natural course of a disease often gives important additional information on the kind of the disease

tors than the mere limitation of information entered, stored and made accessible in the computer, since the fact of working with information technology might have a direct effect on the process of 'diagnosing' itself. In an extreme situation, this could result in the diagnosis being 'adjusted' to the framework defined by the information technology. This could simply be the case if the encoding system does not offer the real diagnosis as a selectable option and therefore, the diagnosis needs to be substituted by an 'available' code, a problem that occurs especially in the initial phase of a new system.

A more 'sinister' variant of this phenomenon occurs when the computer is used to optimise the financial outcome and therefore the patients' diagnosis is altered. The extreme 'Brave new world'[18] version of this kind of reaction is sketched by Samuel Shem in his novel 'Mount Misery': The patients are automatically 're-'diagnosed, leading to those diagnoses the health insurances are currently paying well for[19].

Unrealistic as this scenario might seem, there are tendencies towards this direction. In German hospitals, after a patient has been hospitalised, the software generates not only the DRG according to the entered diagnoses, but gives values of minimum[20] and average duration of the hospitalisation of such cases. If the patient is discharged sooner the remuneration is reduced accordingly, what might obviously affect the motivation to send the patient home. But once the minimum duration has been covered, the hospital administration might 'ask' not to keep a patient too long. Similarly, the DRG gives the hospital already an instant idea of how much a payment can be expected for the case – a situation that might cause pressure on the attending medical practitioner not to opt for too expensive procedures (or in extreme cases to refuse the hospitalisation).

Yet the task of converting a case into a DRG is even more complicated. As mentioned above, the ICD-10 might offer different codes for the same disease, resulting in different DRGs and ultimately different payment. And even the different weighting of the patient's diagnoses might show such a result: It has to be chosen one 'main-diagnosis' with the other ones being 'additional diagnoses' and the right choice of the main-diagnosis can more than double the remuneration. With this 'science' of encoding being so important for the financial wellbeing of the hospital, some journals offer monthly exercises in 'proper' encoding[21]. Obviously these exercises put more emphasise on the best financial outcome within the given regulations, rather than a most conclusive description of the 'real' diagnosis of the patient[22].

'Plausibility-check' and 'End of funds'

The use of IT-technology in processing financial claims for health care facilitates a thorough 'examination' of the providers' claims like, in particular if hospitals or private practitioners hand in digitalised data.

Obviously, the above mentioned claims for hospitalisation can be checked by the health insurance the money is demanded from most easily, with sometimes painstakingly detailed 'requests for explanation' by the insurances. But even the private practitioner is exposed to this kind of 'quality control': Since every consultation or prescription needs a (justifying) diagnose, the health insurance can easily run a test with the data set handed in for claims. This 'plausibility-check' will reveal whether all prescriptions were 'adequate' or whether e.g. a prescribed drug does not match the diagnosis it was prescribed for.

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[18] in his foreword to the 1946 2nd edition of his novel Aldous Huxley states: "The theme of Brave new world is not the advancement of science as such; it is the advancement of science as it affects human individuals". 10 – the very theme of this paper, too!

[19] Shem, Samuel: Mount Misery: "They spent hours (…) reading (…) whichever DSM diagnosis was now bankable. If suddenly insurance was paying top dollar for, say, 301.13, Cyclothymic Disorder, the big Toshiba would be reprogrammed to reprogram all the little Toshibas, so that for data I typed in (…) now it would spew out, time after time like a run of luck at craps in Vegas, 301.13, 301.13, 301.13 (…)". 213

[20] ‚Untere Grenzverweildauer'

[21] e.g. the journal of the German Association of surgeons ‚Der Chirurg BDC'

[22] it is not the author's intention to claim that the above mentioned journal or others would propagate an untrue encoding of the patients' diagnoses, but since it is known that it is difficult to optimise a system with regard to two parameters, the preference might happen to be 'financial outcome' before 'adequacy'

Between different countries, the constraints for the private practitioners (and their potential responses to the quest) differ. In South Africa e.g. the funds for drugs within a given 'medical aid[23]' often are limited *per patient* – once the patient has exceeded these funds, the medical aid is not going to pay for any more drugs under the specific scheme. Here the practitioner should be aware of the 'limitations' if he dispenses drugs from his practise[24], an adequate software in the practise will help to get aware that the funds are exhausted.

On the contrary, in Germany the funds for drug prescription in the private health insurances usually do not have a ceiling. The limitations (and financial risks) for the private practitioner are different: The Bismarckean insurances (with assistance by the above mentioned KVs) under the current legislation, aiming at cost containment, may implement a limit for prescription of drugs, laboratory investigations or physiotherapy *per doctor* (or practice). The software to be used in such a practice in Germany, usually offers functions to estimate whether the recent prescriptions have exceeded such limits. The doctor faces the risk of having the expenses for these excessive drugs/ therapies deducted from the remuneration, within this so called 'Regress'-system, the medical practitioner in effect pays for the prescriptions. The resulting dilemma isn't too difficult to imagine, since the doctor (with assistance by the IT) can figure out when the limits are reached – and then either decide for an alternative therapeutic approach (something that has not been 'overused' yet) or accept a reduced income for the sake of granting the patient the first choice of treatment[25].

Conclusions

As computers and software assist the practitioner in identifying pending financial threats, it is obvious that the use of IT under these circumstances does not necessarily serve the patients' best interest: Given the subjective influence on the making of a diagnosis and the epistemologically 'fragile' quality of the diagnosis, it is not too difficult to imagine that external pressures that are either exercised onto the practitioner or identified by the practitioner by using IT could significantly affect and alter both the diagnosis and the consecutive treatment decided upon by the doctor.

Certainly, information technology has a great potential to assist in making patient care faster, more efficient and more continuous. But as nothing comes without a price, IT in health care could have detrimental effects on the quality of care by

-causing the doctor to *forget* important information (due to 'early diagnosing' and the reduced content of information in digitally 'encoded' diagnoses)

-forcing the doctor to *falsify* diagnoses (to justify treatment or prescriptions if the 'true' diagnosis doesn't serve this purpose or simply doesn't exist in the system)

-tempting the doctor to *avoid* 'expensive' diagnoses and treatments (those identified as might not be paid for by the health insurance)

-motivating the doctor to *discharge* the patient sooner than appropriate (as further hospitalisation might reduce the revenue)

As often with new inventions, the use of IT in health care might thus bear negative effects as well. To gain a broader idea of the potential effects, to help to prevent the negative outcomes and to contribute to an adequate assessment of its role in health care is the intention of this paper.

[23] the expression used in SA for a private health insurance

[24] a usually quite lucrative option if the practitioner has acquired a dispensing licence

[25] the actual trilemma has been demonstrated recently by demonstrating private practitioners in Germany, where after at a certain point in each remuneration term they might rather completely close their practices, as any further activity effectively results in reduced income

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