Evaluating Electronic Health Record Limitations and Time Expenditure in a German Medical Center

Tom de Hoop[1] Thomas Neumuth[1]

[1] Innovation Center Computer Assisted Surgery, Institute at the Faculty of Medicine, Leipzig University, Leipzig, Germany

Appl Clin Inform 2021;12:1082–1090.

Address for correspondence Tom de Hoop, MD, University of Leipzig, Innovation Center Computer Assisted Surgery (ICCAS), Semmelweisstraße 14, 04103 Leipzig, Germany (e-mail: Tom.Hoop@medizin.uni-leipzig.de).

Abstract

Objectives This study set out to obtain a general profile of physician time expenditure and electronic health record (EHR) limitations in a large university medical center in Germany. We also aim to illustrate the merit of a tool allowing for easier capture and prioritization of specific clinical needs at the point of care for which the current study will inform development in subsequent work.

Methods Nineteen physicians across six different departments participated in this study. Direct clinical observations were conducted with 13 out of 19 physicians for a total of 2,205 minutes, and semistructured interviews were conducted with all participants. During observations, time was measured for larger activity categories (searching information, reading information, documenting information, patient interaction, calling, and others). Semistructured interviews focused on perceived limitations, frustrations, and desired improvements regarding the EHR environment.

Results Of the observed time, 37.1% was spent interacting with the health records (9.0% searching, 7.7% reading, and 20.5% writing), 28.0% was spent interacting with patients corrected for EHR use (26.9% of time in a patient's presence), 6.8% was spent calling, and 28.1% was spent on other activities. Major themes of discontent were a spread of patient information, high and often repeated documentation burden, poor integration of (new) information into workflow, limits in information exchange, and the impact of such problems on patient interaction. Physicians stated limited means to address such issues at the point of care.

Conclusion In the study hospital, over one-third of physicians' time was spent interacting with the EHR, environment, with many aspects of used systems far from optimal and no convenient way for physicians to address issues as they occur at the point of care. A tool facilitating easier identification and registration of issues, as they occur, may aid in generating a more complete overview of limitations in the EHR environment.

Keywords

- human–computer interaction
- satisfaction
- electronic health records and systems
- workflow
- physician workload

received
July 12, 2021
accepted after revision
October 11, 2021

Georg Thieme Verlag KG,
Rüdigerstraße 14,
70469 Stuttgart, Germany

DOI https://doi.org/10.1055/s-0041-1739519.
ISSN 1869-0327.

Background and Significance

With an aging population and increasing health care costs, one of the biggest challenges for nations worldwide is to make health care as cost efficient as possible. One way governments have been trying to accomplish this is through increasing emphasis on health information technologies (HIT) such as the use of electronic health records (EHRs) and clinical decision support systems (CDSS). Although HIT have greatly contributed to higher health care standards,[1–6] they also pose challenges, demand great adaptability of health care professionals, and arguably lead to increasing (perceived) task- and workloads.[6,7] Indeed, one recent study evaluating satisfaction over 2 years after implementation of a commercial EHR found that perceptions remained below baseline for most measures rather than improving over time.[8]

Currently, approximately half a physician's time is spent using the EHR,[9–11] much of which is dedicated to documentation, and even during direct patient contact significant time is spent interacting with the EHR.[12] To what extent implementation of EHRs objectively affects physician time adversely is debatable with some studies reporting more time spent on indirect patient care,[13–15] while older studies, in particular, found that time is not affected adversely.[4,16–18] Fragmentation of work, however, does appear to increase, leading to an increased perceived cognitive burden,[18] with the potential effects of fragmentation and interruption on memory, workflow, and patient care well documented.[19,20] Navigating the EHR to find specific pieces of patient information in an ever-growing ocean of data can be difficult and time consuming,[21–24] as is the case for exchange of this data between health care organizations,[25,26] despite the benefits such as shorter patient visits.[25,27] Ultimately, while it is unclear exactly how working in an EHR environment affects workload, it is clear that current implementations have generally not succeeded in meeting expectations of improving the overall workload in health care; even though the expectation is that they can and should. Meanwhile, burnout rates among physicians are steadily on the rise. Clerical burdens associated with the aforementioned issues in particular result in lower work satisfaction and put physicians at risk,[28,29] especially when they do not contribute to a sense of meaning in work activities.[29,30] For example, physicians' skills of diagnosing and treating patients are the most valuable asset of a hospital which clerical burdens detracted from. One study found that over half of the physician workforce in the United States suffers from at least one symptom of burnout,[31] with the impact of burnout on physician wellbeing being enormous through worse interpersonal relations, increased risk of depression, substance abuse, and even suicide.[29,32,33] This in turn may lead to reduced working hours and higher turnover rates[33,34] which affect continuity of care and can invoke heavy financial costs for hospitals.[33] Patient safety is affected directly as well, with burnt-out physicians being associated with increased error rates and worse outcomes.[29,32,35] As such, this is a problem that affects health care on all levels. While physician burnout is complex and dependent on many different work-related factors,[7,29,33,36] the increased (perceived) task and workload associated with use of EHRs do play a role.[6,7,29,30,36] This contrasts the increased productivity and reduction of errors which EHRs were intended and adopted for, to facilitate better quality care.[3–6,37] Therefore, evaluation of EHR limitations remains of vital importance.

Although many successful innovations, particularly CDSS, provide hope,[38,39] many problems remain and many aids, while promising, struggle to be integrated into a physician's workflow.[39] Moreover, while literature regarding time expenditure and general limitations in the EHR environment is abundant, identifying and quantifying specific issues remains difficult and existing literature tends to focus on the United States, with Germany underrepresented. Limiting factors may be that individual physicians allocate different priority to different issues and that obtaining detailed information is time intensive for both researchers and physicians. Additionally, standard tools, such as surveys to assess limitations across larger groups of physicians, tend to gather data only at a single point in time and do not address limitations the moment they occur. As such, there would be merit in developing a tool that allows quick and easy physician registration of specific limitations they encounter in the EHR environment at the point of care.

Objectives

This study set out to add to the knowledge of physician time division and EHR limitations in general but with a focus on Germany specifically. We also aim to illustrate the merit of a tool allowing for easier capture and prioritization of specific clinical needs at the point of care for which the current study will inform development in subsequent work.

Methods

Setting

To obtain a general overview of digital workload, user–system interactions, dominant EHR issues, and time division of physicians, this initial study triangulated time and motion (T&M) observations with semistructured interviews. Participants included residents and attending doctors from a major, representative German university hospital with a capacity of approximately 1,400 inpatient beds. The standard EHR of the study hospital is SAP® IS-H med, a common system in Germany, with the intensive care units (ICUs) and the emergency department instead using COPRA (COPRA System GmbH) as their primary EHR environment. Most day-to-day digital workload takes place in these environments which have been in use for over 10 years; however, some orders (e.g., computed tomography [CT] scans) still require physical order documents. Separate ancillary systems for laboratory, radiology, external documents, and medication management are used. In the study hospital, resident physicians have duties in the wards, outpatient clinics, and operating theater (if applicable) supervised by attending physicians. This is the norm in Germany, as residents

automatically build toward accreditation as a specialist within the discipline they work in.

To determine discipline-transcending themes in limitations and frustrations rather than department specific issues, a range of both surgical and nonsurgical departments were approached via e-mail. The departments of otorhinolaryngology (ENT), neurosurgery, hematology, trauma and abdominal surgery, and the ICU for internal medicine participated; two more departments were approached but ultimately declined due to a surge in novel coronavirus disease 2019 (COVID-19) admissions and the resulting restrictions on visitors, preventing further data gathering. Observations and interviews took place during day shifts to include routine clinical activities such as ward rounds and outpatient encounters, and the resulting digital workload; after-hour activities were discussed in the interviews. A single author (T.H.), a physician with clinical experience in the fields of intensive care medicine and surgery, familiar with SAP® IS-H med, conducted observations and interviews. T.H. had no prior established connections with any of the participants, yet his professional background facilitated trust and understanding.

Data Gathering

Departments were approached by e-mail for participation prior to the observations/interviews. Any resident or attending physician within participating departments was eligible for inclusion. For each department, a coordinating physician introduced the researcher to other physicians within the department based on availability (e.g., not interrupting an ongoing patient encounter) and scheduled activities (e.g., ward rounds, a common outpatient clinic, etc.). These physicians were then asked to participate; coordinating physicians were also interviewed/observed themselves. A total of 19 physicians participated this way, 6 of which only agreed to interviews. All individual participating physicians were informed of the study and gave consent prior to the observations/interviews. Physicians asked patients whether they objected to the presence of an observer prior to starting consultation. The researcher gathered no health information. Consent could be denied at any time with no explanation given.

Observations

We adopted common concepts and predefined categories, actions, and themes for data acquisition in T&M studies describing clinical work,[16,18,40,41] tailoring them to the scope of this study, as is common practice.[16,18] Activities were divided into main categories (search, read, write, direct patient contact, EHR usage during patient contact, calling, and others), each with specific actions.[18] All categories were included in a multitimer smartphone application where time spent per category could be captured within a single screen; measurements using the application were practiced prior to observations. Time data were written down on a registration form (►Supplementary Appendix A, available in the online version) at the end of each observation session. Remaining observed time not registered to any of the main categories and not spent on nonwork-related actions, such as breaks, toilet visits, etc., were registered as "other." To obtain a general idea of the most dominant activities per group without specifically timing them, these activities were marked on the registration form during observations. Limitations encountered by physicians and remarks during observations were written down as well. Observations were checked by member with the observed physicians to assess whether the observed physician considered the session and findings representative of their perceived everyday work.

Semistructured Interviews

Semistructured interviews were conducted with all participants. In case, a participant was observed in addition to being interviewed, questions were generally asked on the work floor, after and in between tasks and patient encounters. The researcher did not interact with patients. Given the semistructured nature, interviews varied per individual participant but always covered the topics of user–system interaction issues, the impact of EHR limitations, clinical needs and desired improvements, subjective division of time and overtime, how system issues are resolved at the point of care/how issues could be addressed, and accessibility of information. Topics and example questions can be viewed in ►Supplementary Appendix B, available in the online version). Time spent per category, observational notes, and talking points were written down summarily during sessions and were subsequently transcribed digitally.

Data Analysis

Descriptive statistics were used to describe how time was divided between activity categories. The percentage of time spent per category was calculated by dividing category time by total observation time. The 95% confidence intervals of cumulative percentages were also calculated. Due to limited sample sizes, comparisons between the ward and outpatient environment, as well as across specialties could not be performed. We applied common concepts in thematic analysis[42,43] where the lead researcher extensively familiarized himself with the data from transcripts of interview/observation notes, identified items of interest, manually cross-referencing them across participants and applying initial coding/sorting. This process was repeated whenever new interview data were acquired and until no new findings emerged which ensured findings were constantly reevaluated and refined. The same applied to the evaluation and refining of emerging overarching themes regarding limitations in the EHR environment which were checked by member with participating physicians over the course of the study. The most important findings and their presence across participants are discussed in this paper.

Results

A total of 19 individual physicians participated across 21 sessions; 12 participants were residents (age: 25–32 [median = 29] years; experience: 1–8 [median = 4] years of experience; five females/seven males) and 7 were attending/

Table 1 Characteristics of participating physicians and situations of gathered data

Departments	Function		Setting		
	Resident	Attending	Outpatient	Ward	Interview
ENT	4	2	3	2	2
Neurosurgery	1	2	3	1	0
Trauma surgery	3	1	2	0	2
Abdominal surgery	2	0	1	2	0
Hematology	1	1	1	0	1
Internal medicine ICU	1	1	0	1	1
Total	12	7	9	6	6

Abbreviations: ENT, otorhinolaryngology; ICU, intensive care unit.
Note: Nineteen individual participants were interviewed and/or observed across 21 sessions; two observations took place with participants observed/interviewed at an earlier point in time as well. Observations in the ICU were considered a situation similar to the wards and counted as such. Six out of 21 sessions concerned interviews without observations.

supervising specialists (age: 35–60 (median = 44) years; experience: 10–36 (median = 14) years of experience; 0 female/7 males). A short period of 2,205 minutes of direct observation time (not including breaks, interviews, unobserved work, etc.) was conducted over 15 out of 21 sessions, 9 of which took place in the outpatient environment (1,310 minutes) and 6 in the wards (895 minutes). The remaining six sessions involved interviews only. One additional attending physician and resident were approached but declined participation altogether (acceptance rate: 90.5%). Median direct observation time of individual participants was 120 minutes (range: 60–290 minutes). Of the observed time, 37.1% was spent interacting with the health records: 9.0% searching, 7.7% reading, and 20.5% writing. Next, 28.0% was spent interacting with patients, corrected for EHR usage during patient interaction, which was 26.9% of the time in a patients' presence. Finally, 6.8% of time was spent calling. The remaining "other" 28.1% of overall observed time was spent primarily on physical discussion (with supervisors/colleagues/nurses), moving around (getting to/from locations, searching for physical documents/patients/supervision/assistance), and reading/writing e-mails. Characteristics of participants and situations are displayed in ►Table 1, results of observations including confidence intervals are displayed in in ►Table 2. A detailed breakdown of time per category per participant can be found in ►Supplementary Appendix C (available in the online version).

Across observations and interviews, within the "search" category, searching diagnostic data (such as laboratories and radiographs) were considered the most common activity; within the "read" category, reading prior patient notes was the most common; and within the "writing" category, writing patient notes was the most common. Physicians considered observations representative of their perceived EHR use on a daily basis. Participants generally reported 1 to 2 hours of daily overtime, almost exclusively spent on documentation tasks, such as writing notes, orders, and letters, and reported a median of 60% (range: 50–75%) of daily work subjectively spent in the EHR environment.

Table 2 Time division across activity categories

Activity categories	Time spent (m)	Percentage of total (95% CI)
Search	197.4	8.95 (7.48–11.02)
Read	168.6	7.65 (5.83–10.49)
Write	452.8	20.54 (17.14–24.84)
Calling	148.9	6.75 (3.44–9.78)
Patient contact[a]	617.2	27.99 (17.43–34.89)
Other	620.0	28.12 (21.54–36.10)
Total	2,205	100
EHR patient contact	226.9	26.88 (17.78–35.54)

Abbreviations: CI, confidence interval; EHR, electronic health records.
[a]EHR use in the presence of the patient constituted 26.88% of all time spent in the patients' presence as demonstrated in the final row of this table. As this was time not spent on patient interaction but rather on EHR tasks, patient contact was corrected accordingly.

The most frequently mentioned themes of issues and frustrations regarding the EHR environment by interviewed physicians, irrespective of discipline, setting, or characteristics, such as experience/age/gender, were as follows: (1) use of multiple HIT systems with limited integration and the resulting spread and fragmentation of information (17 participants); (2) high documentation burden, aggravated by manual "double documentation" of the same patient information (10 participants); (3) poor integration of new data, particularly from diagnostics, such as laboratories, into workflow resulting in a risk of missing important information (eight participants); (4) large limitations on health information exchange between health care centers, requiring time-consuming manual selection, and sending of specific patient information (five participants); (5) the impact all previously mentioned points have on patient interaction, while only six participants specifically stated that they wanted more time for their patients in person, all but three either directly or indirectly spoke of duties pertaining to the

EHR as competing with time for the patients themselves. Other issues mentioned by multiple physicians were fragmentation of work, particularly in the wards, due to extensive multitasking and frequent interruptions; a limited overview of all planned orders/appointments/interventions for individual patients; and, for residents specifically, time loss looking for supervision. All physicians noted that these limitations affected their work satisfaction and that it was difficult to address them; often, problems went unreported.

Discussion

Much of existing literature on clinical time division and EHR limitations tend to focus on the United States, a single department and the outpatient setting.[7,9–12] As such, our multidisciplinary findings across both outpatient and ward environments in a German hospital offer a valuable contribution to this field. Irrespective of department or environment, a large portion of a physician's day was spent on indirect patient care, particularly work in the EHR, more than interaction with the actual patients. It must be noted, however, that observations occurred during daytime shifts, where there was a large degree of patient interaction. When observations ended, work generally continued, mostly consisting of additional documentation, as illustrated by the reported overtime and subjective division of time. Indeed, one recent study found that, although EHR time spent per patient decreases with resident experience, the proportion of EHR time spent after hours did not.[44] Regarding time spent on direct patient contact, all the times when the patient was present in the physicians' company were registered, even at time when the physician was not strictly interacting with the patient. While EHR use in the patient's presence, over a quarter of the time and comparable to other studies[10,45] was accounted for and time corrected accordingly, such correction was not applied to other intrusions such as calls in the patient's presence. Overall, this suggests an underestimation of time spent on documentation, particularly concerning the writing of patient letters (which physicians indicated was mostly done after observations ended), and overestimation of time spent interacting with patients and time spent in the "other" category such as discussion/searching for documents or assistance. Regarding the "other" category, a large amount of time (28.1%) was spent not interacting with the patient or EHR, but rather on discussion, e-mails, and moving around/searching. While the first and second can be important parts of patient care, the latter can be highly inefficient as it often concerned finding/sending documents or finding assistance/supervision. Indeed, many doctors complained that orders in particular were much more time consuming as paper documents, preferring digital orders. A good example is the process of ordering a CT scan; the physician must retrieve the document, fill it out by hand (including laboratory values for which they need the EHR) and then send the document or find someone that can send it for them. Finally, finding assistance/supervision was often done by phone but sometimes required actively looking on the work floor. All these processes added up to significant loss of time to the frustration of physicians.

Interviewed physicians indicated that they were welcoming the opportunity of voicing issues and their frustrations regarding implemented HIT systems, as all felt that there were limitations that should be addressed. Indeed, the most frequently mentioned issue was the spread of work and information over too many different systems; both laboratory results and radiology results are viewed in separate systems outside the core EHR system, as is the case for digital medication lists. External and paper documents, when not physically available, are viewed as scans in a separate environment too. Multiple tabs are required for a single patient to view different kinds of information and write notes/letters simultaneously. Most physicians noted this spread made it more difficult to find and document specific information and therefore easier to miss information, one participant describing that "it is only easy to navigate all available information when you know each system and each tab and how your colleagues record information." New results, in particular, laboratory results, were considered at risk of being missed; multiple physicians noted that diagnostic results were not conveniently integrated into workflow, having to manually check for outstanding results, which might result in delayed or missed viewing. Additionally, physicians couldn't easily see whether others had already taken new results into consideration unless specifically documented and unless this documentation was actively looked for, with one participant noting "this poses a major risk for losing relevant details or missing them if you don't specifically look for them in the notes." Documentation, too, suffered from integration issues with different pieces of information recorded in different areas of the EHR. To keep track of work, most physicians would update a paper note rather than the EHR accommodating this, particularly, in the wards where work was considered to be especially fragmented with physicians carrying out tasks for multiple patients simultaneously. Referring to such a tracking document, one participant stated "If not for this, I would not be able to keep track of what I need to do over the course of the day." While some problems might be hospital specific, interoperability/usability/integration issues across EHRs and the resulting spread of information and accompanying risks appear to be the norm rather than an exception, particularly in the United States.[6,7,22,24,25,46–48]

Physicians felt a high documentation burden. In particular, what was described as "double documentation" was a frequently mentioned and observed problem; encounters need to be converted into notes/letters/orders, coded as diagnoses, and for some departments, physicians were also responsible for billing. The latter, in particular, if applicable, was a cause of great discontent. All these actions stem from the same information but take place as separate actions in different dedicated parts of the health record, increasing workload.[22,48–50] As described, such clerical burdens in particular impact work satisfaction and detract from using a physician's unique skills[28–30,49] in which innovations should aim to better harness. One participant voiced this

discontent particularly saliently, saying "Most of my work does not feel like I'm working as a doctor but more like a secretary." To cope with this documentation burden and spread of information, observed physicians would often copy and paste previous information into their current notes, possibly limiting the impact of new information; copy/paste and "note bloat" problems are a well-known symptom of EHR use.[50–52] These findings could suggest that differences in regulations regarding documentation between different countries, while undoubtedly a major factor, might not be the primary driver of dissatisfaction with EHRs in general and documentation in particular, as has been suggested previously.[53]

As for health information exchange between hospitals, many considered this a cumbersome process with the need to search, select, and send specific pieces of patient information and stated a desire for easier access to a patient's data between health care providers. Especially when receiving external information, one participant summarized the problem concisely, stating simply, "often it is not enough" and another mentioning, "patients expect we have all information of all other hospitals but this is not the case." Involvement of many different stakeholders and complex data protection laws were mentioned as limiting factors, which appear to be barriers in other countries as well.[54,55]

Finally, there is the actual interaction between doctor and patient, on which HIT implementations invariably have significant impact.[6,12,24,49] Due to all the above, several physicians felt not enough time was left for the patient outside of the EHR that they would like to have more time to spend face-to-face interaction with their patients. At the very least, all but three participants either directly or indirectly spoke of duties pertaining to the EHR as competing with time for the patients themselves, for example, referring to typing while talking to patients, one participant acknowledged "only this way can I see patients fast enough."

Several of the interviewed physicians had tried addressing some of the problems, either through their superiors or directly via the IT department, but felt this did not lead to notable change; one physician stated that "it takes over 9 months to make one small change." Limited resources and a mismatch between users and providers were frequently cited as suspected limitations. What's more, reporting EHR issues and trying to have them solved takes time, which physicians often do not have, especially if an issue occurs at the point of care, for example, when seeing a patient. As such, a common sentiment was that "you just get used to it" and use workarounds if any existed, meaning many specific issues likely go unreported, one participant lamenting, "nothing ever happens; now I just do it, I don't really care anymore."

Zhang described the problem concisely, stating a frequent lack of human-centered design in HIT, with people often trained to "adapt to poorly designed technology" rather than technology being adapted to the people using it.[56] Indeed, many challenges described well over a decade ago,[56–58] still hold true today in one form or another, despite the acknowledgment that good integration of HIT into workflow with careful evaluation of expectations and preexisting conditions is crucial for success,[26,58–61] as is the incorporation of usability design in the HIT development process.[7,47,51,62] The latter, in particular, has proven to be important as poor usability, not only affects task load[7] but also may impact patient safety.[63,64]

Implications and Future Research

Our initial findings suggest that innovations should focus on better integration of separate information "islands" to improve access to and overview of information. Next, efforts should be made to reduce clerical burdens, in particular, the repeated documentation of similar information, perhaps by better leveraging information already existing within the system through more effective documentation supports. Projects should also attempt to make different health information systems more interoperable to facilitate better HIE. To develop and prioritize targeted solutions, further insights into specific limitations and needs and how frequently they are experienced are required. However, problems are often not reported by physicians themselves, as this takes time they do not have and standard mass evaluation tools such as surveys tend to gather data only at a single point in time and do not capture the situation at the point of care. To this end, subsequent research will focus on the development, evaluation, and implementation of a tool allowing for quick and easy registration of specific limitations in the EHR environment at the point of care. Using our current findings as a basis, we will develop a device independent application where observed and discussed limitations are (sub)categorized in an intuitive overview; iterative review by domain experts will further inform accuracy, specific items to be included and usability. With just a few clicks, physicians will be able to register specific issues within a few seconds as they come up; nonmandatory free-text comments could allow for further elaboration. Due to limited intrusion, such an application could be used by a large number of physicians over multiple days, generating a detailed overview of needs and limitations that also informs on how frequently they are experienced which will aid in prioritization.

Limitations

This study has several limitations. We adopted concepts tailored to research where the primary focus is T&M observations and where individual actions tend to be individually measured, often using multiple observers. This touches on the first major limitation, namely, the limited amount of observation time, not specifically timing individual actions and the lack of interobserver comparison. This limits the value of the time data, and, particularly, regarding the evaluations of individual activities only provides anecdotal evidence due to potential observation bias and recall bias of interviewed physicians, although prior literature supports our findings.[21–24,47–50,62,65,66] However, we considered the T&M measurements secondary to the overall evaluation we set out to obtain, constructing a cross-section of digital work,

shortcomings, and needs more in line with the aims of this study. Indeed, to better evaluate the impact of individual EHR activities on perceived limitations and workload, the envisioned registration tool could help address this limitation in subsequent research.

The next limitation is that the current study was conducted in a single center with a limited amount of observed and interviewed physicians, not permitting comparison between settings and departments. Many different hospitals have varying patient management systems. As such, some of our findings might be primarily applicable to the study hospital. That being said, at the very least, the study hospital is representative of many other large hospitals across Germany; anecdotally, multiple physicians who had worked in different hospitals mentioned similar issues. However, to further validate our findings, additional data from more physicians/departments and ultimately different centers is required; here too, a tool to quickly identify and register issues at the point of care would be useful.

Finally, as is the case for all studies implementing direct observations, the presence of an observer might have affected behavior of the observed physicians.

Conclusion

The aim of this initial study was to create a general profile of time expenditure, shortcomings, and needs regarding the EHR environment in a large university hospital in Germany. Over one-third of physicians' time was spent interacting with the EHR environment and many EHR activities suffered from limitations, with a limited ability of physicians to address these issues as they came up. As such, there is need for a tool facilitating easier identification and registration of issues as they occur. In subsequent research, we will develop and implement such an application, allowing physicians to register specific issues quickly at the point of care. This will aid in generating a more complete overview of limitations in the EHR environment which in turn can help guide the development of corresponding solutions.

Clinical Relevance Statement

A large amount of German physicians' time is spent interacting with the electronic health records, where many frustrations and issues persist which can be hard for physicians to address. To develop and prioritize more specific solutions, better insights into more specific limitations and needs are required. The current findings will serve as a basis for the development of a tool allowing physicians to easily register such limitations and needs at the point of care.

Multiple Choice Questions

1. When does documentation burden contribute most to physician dissatisfaction?
   a. When it interferes with the physician-patient interaction
   b. When it is performed outside of working hours
   c. When it does not contribute to meaning in work
   d. All of the above

   Correct Answer: The correct answer is option d. Literature identifies documentation burden as a major theme of frustration, with physicians generally perceiving this burden as increased after electronic health record implementation. A significant part of a patient encounter might be spent documenting it, while the patient is present and often an important source of overtime is remaining documentation which could not be completed during working hours, both sources of dissatisfaction. Particularly when documentation duties do not contribute to a sense of meaning in work activities, they can be associated with a higher risk of burnout.

2. What has the impact of electronic health records on the quality and availability of patient data generally been?
   a. They have improved quality and availability patient data in all aspects.
   b. They have had a positive impact on quality but not strictly on availability of data.
   c. They have had a positive impact on availability but not strictly on quality of data.
   d. They have had a negative impact on quality and availability of patient data in all aspects.

   Correct Answer: The correct answer is option c. While the introduction of electronic health records has made access to patient information easier and has led to more data being available in general, the impact on quality of this data has not been uniformly positive. With more and more patient data accumulating and, more importantly, a lot of this data not necessarily clinically important (e.g., because of redundant copied information), it can be more difficult and/or time consuming for physicians to find the specific information they need to construct a medical narrative.

Protection of Human and Animal Subjects

The study was performed in compliance with the World Medical Association Declaration of Helsinki on Ethical Principles for Medical Research Involving Human Subjects, and was waived by the Institutional Review Board of the university medical center Leipzig.

Funding

This research did not receive any specific grant from funding agencies in the public, commercial, or not-for-profit sectors.

Conflict of Interest

None declared.

Acknowledgments

The authors thank all participating departments and individual physicians from the University medical center Leipzig the study took place for their help and insights.

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