


# Lost in translation: Unveiling medical students' untold errors of medical history documentation

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## Abstract

**Objective:** The accurate documentation of a medical history interview is an important goal in medical education. As students' documentation of medical history interviews is mostly decentralised on the wards, a systematic assessment of documentation quality is missing. We therefore evaluated the extent of details missed in students' medical history reports in a standardised setting.

**Methods:** In this prospective, observational study, 123 of 380 students (32.4%) participated in an Objective Structured Clinical Examination (OSCE) regarding history taking and documentation. Based on the interviews and nine deductively selected main categories, a categorical system was established using a summarising qualitative content analysis. The items in the transcripts (defined as ground truth) and in students' reports were labelled and assigned to the correct subcategory. The ground truth and students' reports were compared to quantify students' documentation completeness.

**Results:** Next to the nine deductively selected main categories, 61 subcategories were defined. A total of 8943 items were labelled in the 123 interview transcripts (ground truth), compared with 5870 items labelled in students' reports (65.6% completeness of students' reports compared with ground truth). The main category *personal details* overlapped with 94.2% between students' report and ground truth in contrast to the main category with the highest discrepancy, *allergy*, with 41.1% overlap. Pertinent negative items and non-numerical quantifications were often missed.

**Conclusions:** Medical students show incomplete documentation of medical history interviews. Therefore, accurate documentation should be taught as an important goal in medical education.

## 1 | INTRODUCTION

### 1.1 | Background

Many health care professionals work together in hospitals, and detailed documentation in the patient record is a key form of communication. It permits higher quality patient care<sup>1,2</sup> and allows other colleagues and professions to understand the nature and development of the patient's illness.<sup>3</sup> On the other hand, mistakes in record keeping may lead to medical errors and even compromise patient safety.<sup>4</sup> Therefore, it is essential for medical students to learn how to document their medical history findings in an organised manner as part of the patient record.

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The importance of documenting a medical history is universally recognised among medical educators and is even defined as an Entrustable Professional Activity (EPA) in some countries, such as in the USA.<sup>5</sup> The German National Competency-based Catalogue of Learning Objectives (NKLM) also states that students should be able to document their findings upon obtaining a structured medical history.<sup>6</sup>

A medical history interview must be carried out before being able to document the findings in a report. Many different history taking teaching formats have been discussed in a systematic review, and the gold standard for assessing this competency should be in the form of an Objective Structured Clinical Examination (OSCE).<sup>7</sup> Further studies have shown that history taking courses are also feasible in an online format in the context of the COVID-19 pandemic.<sup>8-11</sup>

Several studies have previously discussed the importance of documentation skills of the medical history interview in medical education and have evaluated documentation skills by medical students showing deficiencies in this competency.<sup>12-15</sup> A documentation analysis was also carried out with postgraduate clinicians.<sup>16</sup> However, clinicians may focus on a more efficient approach, in comparison with a more complete and systematic approach during medical school.<sup>17</sup> More specific investigations were also performed among medical students focusing especially on errors found during the documentation of the family history and psychosocial information rather than on the medical history as a whole.<sup>18,19</sup> Furthermore, it was found that unnecessary or meaningless details for the documenting person should not be

neglected in the report as they may be relevant for others.<sup>20</sup> Similarly, the documentation of the clinical exam was analysed, also showing errors in the report.<sup>21</sup> To address the error rate in documentation, studies have looked into new teaching formats such as a specifically designed workshop.<sup>22</sup>

Although the above-mentioned studies demonstrate a deficit in documentation with variable characteristics, only little research has been conducted to date to provide information on the type, quantity and relevance of documentation errors made by students. As students' documentation of medical history interviews is mostly decentralised on the wards, a systematic assessment of documentation quality is often missing. To the best of our knowledge, our mixed-methods study is the first to investigate which aspects of a medical history interview have been systematically neglected in its documentation by medical students using a self-established categorical system for error analysis. This is crucial in order to highlight the areas in which there are still gaps in the medical education curriculum of teaching medical history documentation as well as clarifying its significance for medical students. Thus, students may benefit from a more purposeful medical education program regarding documentation completeness and efficiency, potentially aiding their clinical reasoning skills.

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### 1.2 | Objectives and research question

Our objectives were firstly, to measure the total percentage of correctly documented medical history interview items; secondly, to analyse the completeness of documentation of the medical history interview regarding the main categories and newly defined subcategories within the categorical system; thirdly, to analyse whether there are aspects of a medical history interview that are systematically neglected in medical students' reports; and finally, to establish a categorical system that could be used in the future for obtaining and documenting a structured medical history interview.

Therefore, we identified the following research questions: (1) What type of errors are made in the documentation of medical history interviews by medical students? (2) Do these errors follow a systematic pattern?

## 2 | MATERIALS AND METHODS

### 2.1 | Study design

We chose a prospective, single-centre, observational, mixed-methods study design. The students carried out an OSCE during winter term 2020/2021. Results were then analysed and evaluated: Firstly, we recorded and transcribed the history taking part of the OSCE. Secondly, a qualitative content analysis was performed by two assessors to categorise the content of the interviews into inductive subcategories. Thirdly, the items in both the transcripts (defined as ground truth) and students' reports were labelled and matched to the correct subcategory. Finally, the students' reports and the ground truth were compared, and the completeness of students' documentation was analysed (see Figure 1).

### 2.2 | Cohort

At LMU Munich, all third-year medical students ( $n = 380$ ) are required to undertake the history taking and documentation OSCE at the beginning of their clinical studies. Study participation was completely voluntary, and all students willing to participate were eligible. There was no additional workload for students who took part in the study. A total of 123 third-year students chose to take part in this study. As study participation had no impact on students' grades, it can be assumed that the cohort considered was diverse regarding sex, age and academic achievement. Because of data protection regulations, it was not possible to carry out a demographic analysis. The cohort had previously participated in a medical history taking course in their second year of studies. In this course, they learned the theory of medical history taking, which was followed by obtaining medical histories from different patients in a bedside setting on three consecutive days. After obtaining each medical history, students reported their findings in a

structured manner to the supervising doctor using an instruction manual and an example template, which was available on the learning platform Moodle. The doctors gave feedback after each report to enhance the learning experience.

### 2.3 | History taking and documentation OSCE

#### 2.3.1 | Learning objectives

In the OSCE, it was expected of students to obtain a structured medical history, as well as to document their findings in a correct, complete and organised report upon taking the medical history.

#### 2.3.2 | Learning resources

In preparation for the OSCE, students had the opportunity of watching five online lectures, two example videos of taking a systematic medical history as well as an example of its structured documentation. The instructional videos mainly concentrated on taking a systematic medical history interview and on different questioning techniques. The documentation of the interview was taught during the lectures and by the provided example. The example report portrayed the complete documentation of one of the two recorded example interviews. Because of the COVID-19 pandemic, a preparatory refresher course for the OSCE was not possible. All learning resources were accessible on Moodle.

#### 2.3.3 | OSCE

The OSCE was held in winter term 2020/2021 in an online format because of the restrictions of the COVID-19 pandemic at the time.

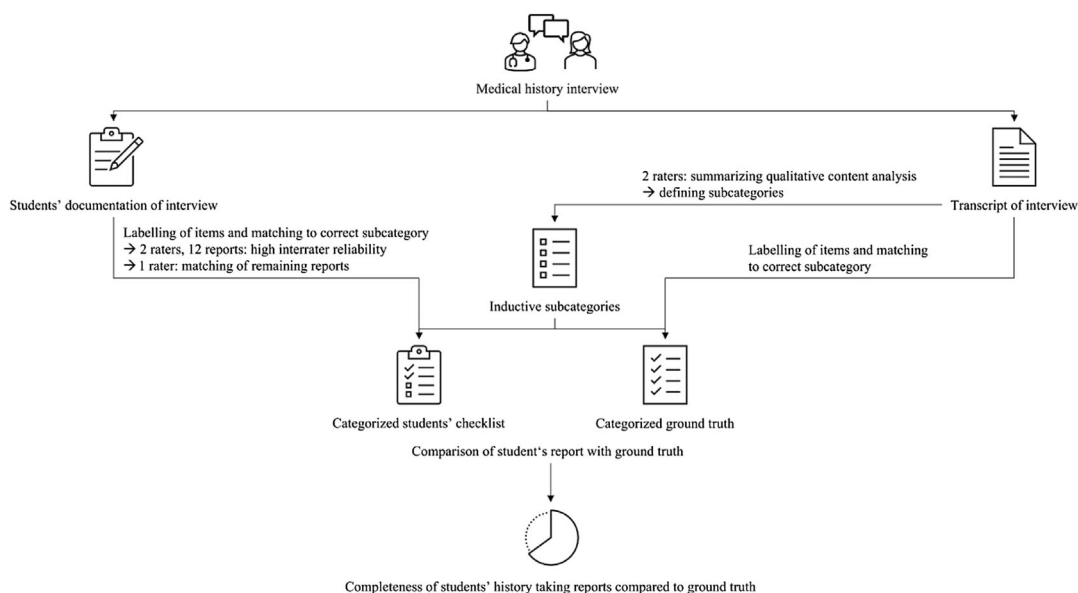


FIGURE 1 Representation of the study design.

We used standardised patients with fictitious patient cases dealing with a range of common diseases of internal medicine, for example, influenza, pneumonia or cystitis ( $n = 57$  different patient cases). Specialists of internal medicine reviewed the cases before the OSCE. The OSCE consisted of two stations: Firstly, they obtained a medical history, and secondly, they documented their findings in a structured report. Students were given a random timeslot on the day of the OSCE. They had 10 minutes to obtain a medical history from a standardised patient, who was assigned a random fictitious case, unknown to the students. Students were allowed to take notes during the interview, which afterwards could be used to document their findings in the report. Interviews were held and recorded via the communication platform Zoom. After the interview, all students were required to document their findings in a structured report and upload it to Moodle as a proof of completion. The medical history interviews were rated using standardised evaluation forms used at LMU Munich. Depending on the score, students could either pass or fail (pass > 60% > fail). Students were required to submit their report in order to be able to pass the OSCE. However, the completeness of the reports was not evaluated as part of the OSCE, and there was no time limit for students to create their report. All recordings were transcribed, and after, transcripts and reports were pseudonymized.

## 2.4 | Data analysis

The transcripts of the medical history interviews were used to identify relevant content in a categorical structure. We derived deductive main categories from the textbook *Anamnese und körperliche Untersuchung*,<sup>23</sup> as this forms the foundation for the course and is recommended for students by LMU Munich. Items of the transcripts were categorised and summarised by topic using summarising qualitative content analysis. Two assessors then defined subcategories within the main

categories. All 123 interview transcripts were used to carry out the analysis. In the first step, each assessor performed an individual analysis, and in the second step, a consensus was reached after a thorough discussion. Subcategories were binary (complete/incomplete) and were designed to be highly specific to avoid ambiguities.

The transcripts were labelled using both the deductively defined main categories and the inductive subcategories. The result of this process determined the ground truth of each medical history interview, namely what should ideally have been documented following the interview.

In a further step, all students' reports were labelled using the above-mentioned categories. The first 10% (12 reports) of students' reports were labelled by two independent raters (SL, KD) to assess interrater agreement based on Cohen's kappa for both the ground truth and students' reports. Given a high Cohen's kappa (>0.8), one rater continued labelling the remaining reports.

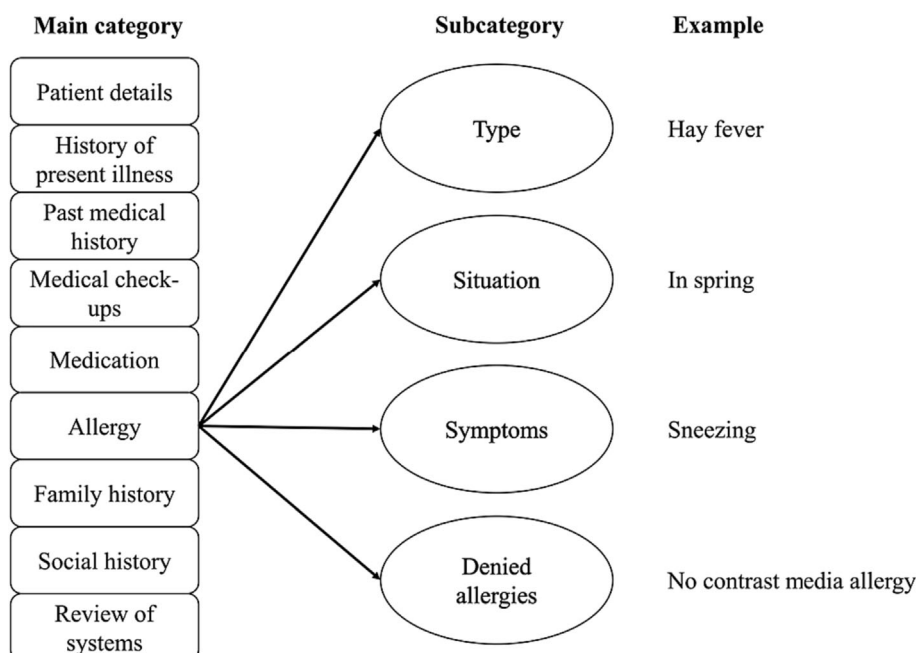
## 2.5 | Statistics

The interrater reliability was measured using Cohen's kappa. Mean and percentage values of all main categories' and subcategories' completeness were calculated with Microsoft Excel, version 16.66.1.

## 3 | RESULTS

### 3.1 | Overall results

In total, 380 students undertook the OSCE in winter term 2020/2021. A total of 123 students chose to take part in this study (participation rate = 32.4%). All study participants successfully uploaded their report of the medical history interview to Moodle.



**FIGURE 2** Exemplary categorical tree for the main category *allergy*.

### 3.2 | Categorical tree

Nine main categories were deductively selected. After carrying out the summarising qualitative content analysis using the transcripts of all 123 interviews, a total of 61 subcategories were defined (see Figure 2). See the table in the Supporting Information for the full categorical tree including all main categories, subcategories and examples.

### 3.3 | Interrater reliability

Within the 12 interviews used to calculate Cohen's kappa, 863 items were labelled in the transcripts and 572 items were labelled in students' reports. Cohen's kappa for the transcripts was 88.8% and 94.3% for students' reports indicating a high level of reliability.

### 3.4 | Quantitative outcomes

Overall, 8943 items were identified based on the analysis of the 123 medical history interview transcripts (ground truth) and then appointed to the respective subcategories. In comparison, 5870 items were labelled in students' reports (65.6% compared with ground truth). Thus, percentage completeness of documentation for the main categories ranged from 41.1% to 94.2% (see Table 1). Students reported 94.2% and 82.6% of all identified items in the main category *personal details* and *social history*, respectively. In comparison, the main categories with the lowest degree of completeness included *allergy* (41.1%) and *family history* (54.4%).

**TABLE 1** Percent completeness of documentation of students' history taking reports as shown for each main category and the overall score including the standard deviation (SD) in brackets.

Main category	Completeness of documentation (SD) in %
Patient details	94.2 (±15.5)
History of present illness	64.9 (±12.1)
Past medical history	61.3 (±22.5)
Medical check-ups	61.5 (±37.4)
Medication	66.4 (±22.3)
Allergy	41.1 (±31.6)
Family history	54.4 (±29.6)
Social history	82.6 (±16.2)
Review of systems	62.1 (±22.4)
Overall	65.6 (±9.6)

*Percentage completeness of documentation for the main categories ranged from 41.1% to 94.2%.*

### 3.5 | Qualitative outcomes

Somatic symptoms were mostly documented correctly, for example, 'the patient's main symptoms are cough and dyspnea'. On the other hand, symptoms that were often not documented by students included psychiatric symptoms, for example, 'the patient feels lethargic'.

Another example of the qualitative analysis can be portrayed in the subcategory *quantity*: Students were able to correctly document the symptom quantity when it was stated using the numeric rating scale (NRS), for example, 'pain 5/10 on the NRS'. However, students often did not document the symptom quantity when it was described in words, for example, 'the patient reports moderate pain'.

The patient's symptoms were frequently re-documented in the main category *review of systems*, for example, 'cough' and 'dyspnea'. However, many denied symptoms covered in the interview were not documented, for example, 'no fever' or 'no gastrointestinal symptoms'.

## 4 | DISCUSSION

In this prospective, single-centre, observational, mixed-method study, we established a categorical system to characterise the documentation of a medical history interview. Based on these categories, we managed to show that medical students miss out on several details in their reports and identified systematic patterns. The highest discrepancy was found in the main category *allergy* compared with *patient details* with the highest percentage completeness of documentation. Pertinent negative items and non-numerical adjectives for quantification were often missed.

*The highest discrepancy was found in the main category allergy compared to patient details with the highest percentage completeness of documentation.*

The aforementioned systematic errors in students' reports will allow medical education documentation courses to be modified accordingly to address these issues. Students would then be able to complete the patient record in a more precise and complete manner, which in turn could improve their clinical reasoning skills. Prospective, randomised studies should focus on identifying clinically significant aspects of the medical history to further explore which documentation errors are most clinically relevant. This would help future medical education courses to lay their focus on these errors.

Furthermore, the categorical system could be used by a range of health care professionals in the future, firstly, to obtain and document a structured medical history interview; secondly, to assess medical students in exams; thirdly, to perform intervention trials; and finally, even for the development of electronic medical records (EMRs). The advantages of our system are that it was inductively established based on 57 different patient cases and therefore covers a broad disease and symptom range, and that the results of the interrater reliability show a strong and almost perfect level of agreement respectively.<sup>24</sup> Furthermore, it enables students with little clinical experience to use it as a framework, which they can build upon with more knowledge and experience. This categorical system could also be used in the form of a checklist, as these have been shown to improve documentation rates on ward rounds.<sup>25</sup> Prospective, randomised studies should be carried out to evaluate the validity of the categorical system.

Other studies have also shown that students omit details of medical history interviews in their report but to the best of our knowledge, this is the first study to use a categorical system to systematically investigate which aspects of a medical history interview were not documented by medical students.

Ferenchick et al. identified documentation errors when students reported on medical history information, which they had gathered from virtual cases without time pressure. Although the categories for the missing information were already given, it was still reported that 30.6% of students made documentation errors and that students with more documentation errors performed worse in the end-of-year OSCE.<sup>15</sup>

Zorn et al. reported that around 60% of physician assistant students correctly documented the finding of a skin lesion consistent with melanoma, which was based on a finding from the medical history interviews. This shows a similar result to the overall documentation completeness found in our study. However, study participants were physician assistant students, and all students worked on a single clinical case only.<sup>21</sup>

In Van Dijk et al.'s study, only 16% of the 244 reports of a medical history interview on colorectal carcinoma cases included a recorded family history. In comparison with our study, this data is based on real patient cases. However, this study only analysed the documentation of the family history without paying attention to the remaining parts of the medical history interview.<sup>18</sup> Compared with this, the completeness of reporting family history in our study seems to be much higher with 54.4%. However, we only compared the transcripts of the interviews with the reports and did not investigate potentially missed information during the medical history interview, which might explain the discrepancy.

Similarly, it was also shown that physicians omit parts of the interview in their notes.<sup>16</sup> This shows that even experienced doctors with good clinical reasoning skills still have difficulties with the documentation of clinically significant information. This study focused on items relative to main categories but did not establish a categorical system with the division of subcategories. This may not be as precise as our presented specific categorical system, as this enables a higher accuracy.

When evaluating the fact that students did not perform well in all categories of our study, it is important to consider that the study population consisted of third-year medical students who had just completed their preclinical studies and, also due to the COVID-19 pandemic, only had little practice in taking and documenting a medical history interview.<sup>11</sup> It might be assumed that some students underestimated the clinical importance of documenting certain items, since clinical knowledge of its relevance could be lacking.<sup>26</sup> However, in a study by Langewitz et al., it was reported that even physicians, on average in their third year of training, only documented parts of the medical history interview correctly.<sup>19</sup> Thus, insufficient clinical training regarding the importance of thorough documentation might be another explanation for our results. Most studies usually focus on students' documentation, but it would be useful to compare students' results with those of trained physicians to assess whether clinical experience has an impact on documentation completeness and correctness or the relevance of the missing information.

Another important point to consider is that in clinical practice, experienced physicians do not document every piece of information; with increasing experience, students and physicians improve their clinical reasoning skills and can focus on a symptom-directed interview and its documentation.<sup>16</sup> Clinical reasoning skills also improved during the COVID-19 pandemic.<sup>27</sup> However, in medical education, and especially regarding third-year students with little clinical experience, it is important for them to learn and apply a complete and systematic medical history interview as well as its thorough documentation. Some authors have described that new information has to be learnt in layers from which new connections can arise.<sup>28,29</sup> Hence, at the beginning of a learning process, students have little experience, and it is not possible to differentiate between clinically important and irrelevant information. Later, with increasing experience and knowledge, interviews and chart documentations become more symptom-orientated and specific. Experienced students or physicians may only revert to the original systematic structure when problems or uncertainties arise. Therefore in this study, the completeness was assessed as this is an essential part of medical education for clinically inexperienced students. For this reason, students were not constrained with a time limit for writing their report as this would negatively influence its completeness.

Surprisingly, the main category *allergy* had the highest discrepancy between students' reports and ground truth, although existing allergies were correctly documented in most cases. However, the lack of documentation of the subcategory *denied allergies* explained most of the discrepancy. This may be because most students did not see the importance of documenting denied items. This was also reported



in a study using standardised patient cases, which suggested that students were significantly more likely to document pertinent positive items in comparison with pertinent negative items.<sup>26</sup> Pertinent negative items can have a great significance in clinical decision making, and if neglected, can underestimate the quality of care provided and even lead to inaccurate diagnosis.<sup>30</sup>

Students may find it hard to improve their skills in documentation because of the lack of feedback on their notes.<sup>31</sup> This was also the case in the OSCE carried out during this study. Furthermore, it is noted that education in the form of lectures and seminars regarding documentation is minimal and most students are taught by direct feedback from junior doctors in hospitals, which mostly happens during clinical placements in more advanced semesters.<sup>32</sup> Structured feedback during clinical courses is often missing and supervising physicians mostly experience time constraints and hence cannot analyse potential documentation errors.<sup>33</sup> Specifically designed workshops or written assignments could help improve students' documentation skills.<sup>22</sup> Nevertheless, when planning a course, real-life problems such as time pressure should be taken into consideration, especially for students in more advanced semesters. OSCEs with a documentation time limit may help to address this issue.<sup>34</sup>

Furthermore, most clinical documentation is still handwritten leading to avoidable mistakes such as poorly readable documentation or loss of records in comparison to electronic documentation.<sup>35</sup> A structured record-keeping tool on the EMR may have a positive impact on the completeness of clinical documentation<sup>36</sup> and may help the workflow in the long term.<sup>37</sup> Similarly, when comparing electronic to paper medical records, EMRs may improve the level of documentation, even though there are still deficiencies in key components.<sup>38</sup> For example, students often have restrictions such as limited read-only access.<sup>39,40</sup> Moreover, EMRs may initially lead to an increased documentation time and, consequently, a reduced time for doctor-patient interaction.<sup>41</sup> Our newly developed categorical system could help improve electronic documentation tools, by introducing predefined categories and subcategories.

#### 4.1 | Limitations

32.4% of students took part in this study. This could introduce a potential selection bias in the sample. However, participation rates in other studies at LMU Munich showed similar results.<sup>11,42</sup> Given that a relatively high proportion of students from the year group participated, it can be assumed that the cohort represented sex, age and academic achievement sufficiently.

Most of the labelling was carried out by one rater. Nevertheless, we do not expect a significant added value with a second rater because of a high Cohen's kappa.

We cannot rule out that the results may have been affected by the COVID-19 pandemic, given that the study was held with restrictions in place at the time.

The study only investigated students' documentation skills and did not aim to evaluate students' history taking skills. Also, the setting

of an OSCE may not necessarily be generalizable to clinical environments, as grading pressure may lead students to document details that they think will be assessed, rather than what they think is clinically important.

Finally, we could not investigate possible clinical consequences of the non-documented items. This could be the subject of further prospective studies including more advanced students.

## 5 | CONCLUSION

Medical students miss out on several details when documenting a medical history interview. Prospective, randomised studies should be carried out to evaluate the clinical relevance of non-documented pertinent negative items. More attention must be paid to clinical teaching of documenting a medical history interview in a structured report as well as giving direct feedback to students on their performances on the wards. The presented categorical system could be used in clinical teaching for obtaining and documenting a medical history interview as well as for exams or OSCEs.

*The presented categorical system could be used in clinical teaching for obtaining and documenting a medical history interview.*

#### AUTHOR CONTRIBUTIONS

**Silvan Lange:** Conceptualization; methodology; writing—review and editing; data curation; investigation; writing—original draft; visualization; validation; formal analysis. **Nils Krüger:** Conceptualization; data curation; project administration; methodology; writing—review and editing. **Maximilian Warm:** Writing—review and editing; conceptualization; data curation; methodology; project administration. **Johanna Buechel:** Conceptualization; methodology; writing—review and editing; supervision; investigation. **Orsolya Genzel-Boroviczény:** Conceptualization; investigation; methodology; supervision; writing—review and editing. **Martin R Fischer:** Conceptualization; writing—review and editing; supervision; methodology; investigation. **Konstantinos Dimitriadis:** Conceptualization; investigation; methodology; project administration; supervision; writing—original draft; writing—review and editing; validation.

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crucial help in allocating students to random time slots for the OSCE and their excellent cooperation throughout the duration of this project. Everyone's expertise and dedication significantly contributed to the smooth conduct of this study.

### CONFLICT OF INTEREST

The authors declare that they have no known competing financial interests or personal relationships that could have appeared to influence the work reported in this paper.

### DATA PROTECTION

I confirm all personal identifiers have been removed or disguised so the persons described are not identifiable and cannot be identified through the details of the story.

### DATA AVAILABILITY STATEMENT

The data that support the findings of this study are available from the corresponding author upon reasonable request.

### ETHICS STATEMENT

The ethical review board of the Faculty of Medicine of LMU Munich approved the study protocol (project nr. 20-0788). The study was carried out in conformity with the Declaration of Helsinki.

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### REFERENCES

- Cusack CM, Hripscak G, Bloomrosen M, Rosenbloom ST, Weaver CA, Wright A, et al. The future state of clinical data capture and documentation: a report from AMIA's 2011 policy meeting. *J Am Med Inform Assoc.* 2013;20(1):134–40. <https://doi.org/10.1136/amiajnl-2012-001093>
- Liang JW, Shanker VL. Education in neurology resident documentation using payroll simulation. *J Grad Med Educ.* 2017;9(2):231–6. <https://doi.org/10.4300/JGME-D-16-00235.1>
- Patenaude AF, Pelletier W, Bingen K. Communication, documentation, and training standards in pediatric psychosocial oncology. *Pediatr Blood Cancer.* 2015;62(Suppl 5):S870–95. <https://doi.org/10.1002/pbc.25725>
- Koh J, Ahmed M. Improving clinical documentation: introduction of electronic health records in paediatrics. *BMJ Open Qual.* 2021;10(1):e000918. <https://doi.org/10.1136/bmjopen-2020-000918>
- Association of American Medical Colleges, Core entrustable professional activities for entering residency, 2014. [https://store.aamc.org/downloadable/download/sample/sample\\_id/63/](https://store.aamc.org/downloadable/download/sample/sample_id/63/)
- M. Fakultätentag, Nationaler Kompetenzbasierter Lernzielkatalog Medizin - Version 2.0, 2021. <http://nklm.de>
- Keifenheim KE, Teufel M, Ip J, Speiser N, Leehr EJ, Zipfel S, et al. Teaching history taking to medical students: a systematic review. *BMC Med Educ.* 2015;15(1):159. <https://doi.org/10.1186/s12909-015-0443-x>
- Shoemaker MM, Lippold C, Schreiber R, Levy B. Novel application of telemedicine and an alternate EHR environment for virtual clinical education: a new model for primary care education during the SARS-CoV-2 pandemic. *Int J Med Inform.* 2021;153:104526. <https://doi.org/10.1016/j.ijmedinf.2021.104526>
- Harendza S, Gärtner J, Zelesniack E, Prediger S. Evaluation of a telemedicine-based training for final-year medical students including simulated patient consultations, documentation, and case presentation. *GMS J Med Educ.* 2020;37(7):Doc94.
- Aziz K, Sherif NA, Meshkin RS, Lorch AC, Armstrong GW. Telemedicine curriculum in an ophthalmology residency program. *J Acad Ophthalmol.* 2017;14(1):e93–e102. <https://doi.org/10.1055/s-0042-1743580>
- Lange S, Krüger N, Warm M, Op den Winkel M, Buechel J, Huber J, et al. Online medical history taking course: opportunities and limitations in comparison to traditional bedside teaching. *GMS. J Med Educ.* 2022;39(3). PMID: Doc34.
- Wilson BE. Performance-based assessment of internal medicine interns: evaluation of baseline clinical and communication skills. *Acad Med.* 2002;77(11):1158. <https://doi.org/10.1097/00001888-200211000-00023>
- Kasai H, Shikino K, Saito G, Tsukamoto T, Takahashi Y, Kuriyama A, et al. Alternative approaches for clinical clerkship during the COVID-19 pandemic: online simulated clinical practice for inpatients and outpatients—a mixed method. *BMC Med Educ.* 2021;21(1):149. <https://doi.org/10.1186/s12909-021-02586-y>
- Lai J, Tillman D. Curriculum to develop documentation proficiency among medical students in an emergency medicine clerkship. *Med Ed Portal.* 2021;17:11194.
- Ferrenchick GS, Solomon D, Mohmand A, Towfiq B, Kavanaugh K, Warbasse L, et al. Are students ready for meaningful use? *Med Educ Online.* 2013;18(1):22495. <https://doi.org/10.3402/meo.v18i0.22495>
- Weiner SJ, Wang S, Kelly B, Sharma G, Schwartz A. How accurate is the medical record? A comparison of the physician's note with a concealed audio recording in unannounced standardized patient encounters. *J Am Med Inform Assoc.* 2020;27(5):770–5. <https://doi.org/10.1093/jamia/ocaa027>
- Rodríguez-Fernández JM, Loeb JA, Hier DB. It's time to change our documentation philosophy: writing better neurology notes without the burnout. *Front Digit Health.* 2022;4:1063141. <https://doi.org/10.3389/fdgh.2022.1063141>
- van Dijk DA, Oostindiër MJ, Kloosterman-Boele WM, Krijnen P, Vasen HF. Family history is neglected in the work-up of patients with colorectal cancer: a quality assessment using cancer registry data. *Fam Cancer.* 2007;6(1):131–4. <https://doi.org/10.1007/s10689-006-9114-8>
- Langewitz WA, Loeb Y, Nübling M, Hunziker S. From patient talk to physician notes—comparing the content of medical interviews with medical records in a sample of outpatients in internal medicine. *Patient Educ Couns.* 2009;76(3):336–40. <https://doi.org/10.1016/j.pec.2009.05.008>
- Saravi BM, Asgari Z, Siamian H, Farahabadi EB, Gorji AH, Motamed N, et al. Documentation of medical records in hospitals of Mazandaran University of Medical Sciences in 2014: a quantitative study. *Acta Inform Med.* 2016;24(3):202–6. <https://doi.org/10.5455/aim.2016.24.202-206>
- Zorn J, Snyder J, Guthrie J. Use of moulage to evaluate student assessment of skin in an objective structured clinical examination. *J Physician Assist Educ.* 2018;29(2):99–103. <https://doi.org/10.1097/JPA.0000000000000205>
- Bynum D, Colford C, Royal K. Teaching medical students the art of the 'write-up'. *Clin Teach.* 2015;12(4):246–9. <https://doi.org/10.1111/tct.12304>
- J. Seiderer-Nack, A. Sternfeld, Anamnese und körperliche Untersuchung, 2018.
- McHugh ML. Interrater reliability: the kappa statistic. *Biochem Med (Zagreb).* 2012;22(3):276–82.



25. Treloar EC, Ting YY, Kovoor JG, Ey JD, Reid JL, Maddern GJ. Can checklists solve our ward round woes? A systematic review. *World J Surg.* 2022;46(10):2355–64. <https://doi.org/10.1007/s00268-022-06635-5>
26. Walling A, Moser SE, Dickson G, Zackula RE. Are students less likely to report pertinent negatives in post-encounter notes? *Fam Med.* 2012;44(1):22–5.
27. Hermasari BK, Nugroho D, Maftuhah A, Pamungkasari EP, Budiastuti VI, Laras AA. Promoting medical student's clinical reasoning during COVID-19 pandemic. *Korean J Med Educ.* 2023;35(2):187–98. <https://doi.org/10.3946/kjme.2023.259>
28. Hawkins J, Blakeslee S. *On Intelligence St. Martin's Griffin*; 2005.
29. Kahneman D. *Thinking, fast and slow* Farrar, Straus and Giroux; 2011.
30. Szauter KM, Ainsworth MA, Holden MD, Mercado AC. Do students do what they write and write what they do? The match between the patient encounter and patient note. *Acad Med.* 2006;81(10 Suppl):S44–7. <https://doi.org/10.1097/00001888-200610001-00012>
31. Heiman HL, Rasminsky S, Bierman JA, Evans DB, Kinner KG, Stamos J, et al. Medical students' observations, practices, and attitudes regarding electronic health record documentation. *Teach Learn Med.* 2014;26(1):49–55. <https://doi.org/10.1080/10401334.2013.857337>
32. Rowlands S, Coverdale S, Callen J. Documentation of clinical care in hospital patients' medical records: a qualitative study of medical students' perspectives on clinical documentation education. *Health Inf Manag.* 2016;45(3):99–106. <https://doi.org/10.1177/1833358316639448>
33. Rousseau M, Könings KD, Touchie C. Overcoming the barriers of teaching physical examination at the bedside: more than just curriculum design. *BMC Med Educ.* 2018;18(1):302. <https://doi.org/10.1186/s12909-018-1403-z>
34. Farooqi M, Aljibury O, Arfeen F, Syed U, Cheema H, Choudri M. Using OSCEs to test students' documentation skills. *Clin Teach.* 2017;14(1):65–7. <https://doi.org/10.1111/tct.12511>
35. Bruner A, Kasdan ML. Handwriting errors: harmful, wasteful and preventable. *J Ky Med Assoc.* 2001;99(5):189–92.
36. Haworth S, Bates AS, Beech A, Knevil G. Quality improvement in documentation for patients with suspected facial fractures: use of a structured record keeping tool. *Emerg Med J.* 2016;33(4):268–72. <https://doi.org/10.1136/emermed-2015-205141>
37. Baumann LA, Baker J, Elshaug AG. The impact of electronic health record systems on clinical documentation times: a systematic review. *Health Policy.* 2018;122(8):827–36. <https://doi.org/10.1016/j.healthpol.2018.05.014>
38. Witkowski C, Kimmel L, Edwards E, Cosic F. Comparison of the quality of documentation between electronic and paper medical records in orthopaedic trauma patients. *Aust Health Rev.* 2022;46(2):204–9. <https://doi.org/10.1071/AH21112>
39. Mintz M, Narvarte HJ, O'Brien KE, Papp KK, Thomas M, Durning SJ. Use of electronic medical records by physicians and students in academic internal medicine settings. *Acad Med.* 2009;84(12):1698–704. <https://doi.org/10.1097/ACM.0b013e3181bf9d45>
40. Hammoud MM, Margo K, Christner JG, Fisher J, Fischer SH, Pangaro LN. Opportunities and challenges in integrating electronic health records into undergraduate medical education: a national survey of clerkship directors. *Teach Learn Med.* 2012;24(3):219–24. <https://doi.org/10.1080/10401334.2012.692267>
41. McCarthy B, Fitzgerald S, O'Shea M, Condon C, Hartnett-Collins G, Clancy M, et al. Electronic nursing documentation interventions to promote or improve patient safety and quality care: a systematic review. *J Nurs Manag.* 2019;27(3):491–501. <https://doi.org/10.1111/jonm.12727>
42. Leunig A, Winkler M, Gernert JA, Graupe T, Dimitriadis K. Management lessons through an interactive online discussion about hospital management during the COVID-19 pandemic. *GMS J Med Educ.* 2021;38(1):Doc25.

#### SUPPORTING INFORMATION

Additional supporting information can be found online in the Supporting Information section at the end of this article.

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